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Personal Computing Today

January 1984
80p

Software Special

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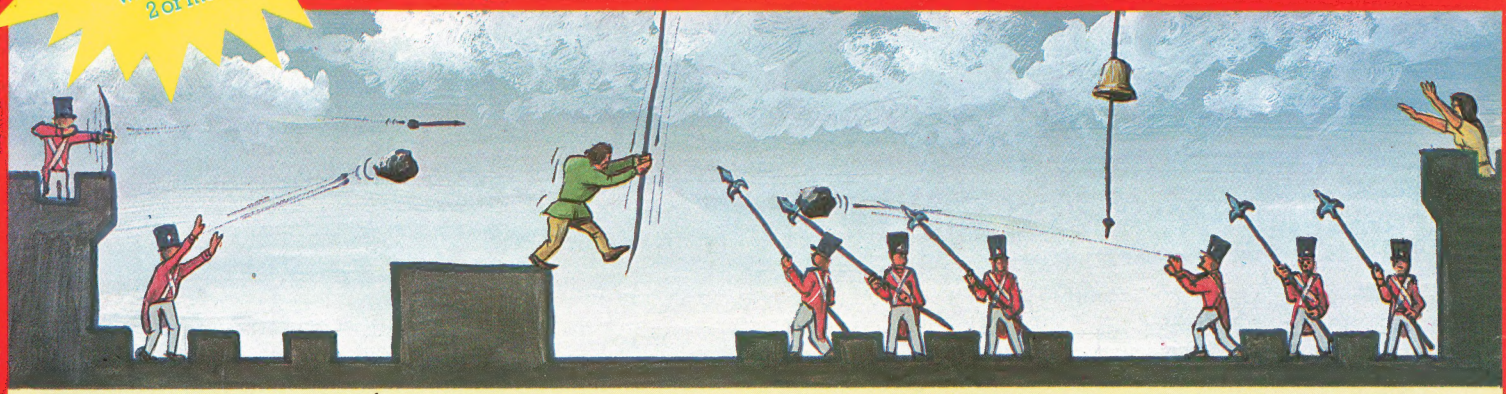
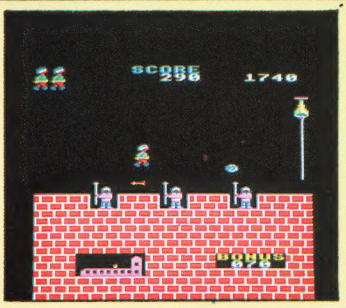


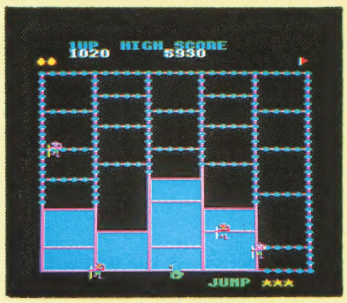


HUNCHBACK (32K) £7.95

An excellent version of the arcade game where Quasimodo attempts to rescue Esmeralda. Beautifully detailed animation (the best we've yet seen!) as Quasimodo leaps over the ramparts dodging rocks and arrows, swinging on ropes, avoiding the guards' spears, and ringing the bells. Twelve different screens of action! This program is sold under licence from Century Electronics Ltd; we have exclusive rights to its sale for use on the BBC micro.

(For use with KEYBOARD or JOYSTICKS).

●●● *NEW RELEASE* ●●●

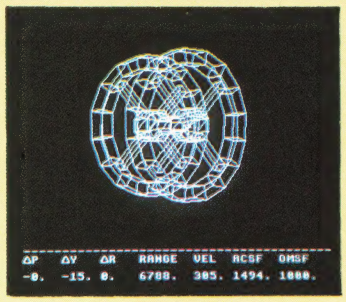


CRAZY PAINTER (32K) £7.95

The only full-feature version available for the BBC micro. On the first screen, you take the part of a monkey being chased by African tribesmen. If you manage to survive by painting-in all the squares, the bonus screen features the monkey trying to reach his bunch of bananas. After that, you take control of a paint-roller and each square painted-in adds to your score. But beware . . . the teddy-bears are now in hot pursuit. Superb animation and sound-effects.

(For use with KEYBOARD OR JOYSTICKS).

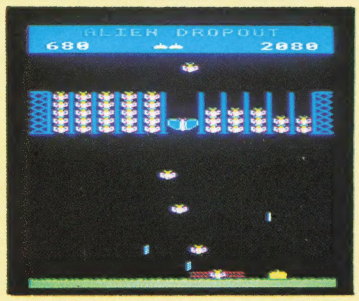
●●● *NEW RELEASE* ●●●



2002 (32K) £7.95

A space docking simulator using a 3D graphics to model the motions and responses of the ORION 4 spacecraft. Your mission is to pilot the shuttle to a "soft dock" with the space station. PITCH, YAW, ROLL, FORWARD, LATERAL and VERTICAL engines are provided together with orbit manoeuvering booster engines. 6 skill levels provide for the completely inexperienced pilot as well as the fully-fledged commander.

●●● *NEW RELEASE* ●●●



ALIEN DROPOUT (32K) £7.95

A novel and unusual program. Arcade-action with this exciting multi-stage shooting game. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground.

(For use with KEYBOARD or JOYSTICKS).

". . . these moths are out to get more than the clothes in your wardrobe.

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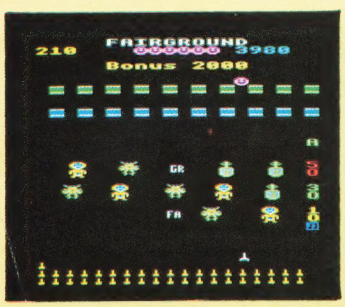


FAIRGROUND (32K) £7.95

An exciting target-shooting game! Bonuses are scored for spelling out the word FAIRGROUND by hitting the appropriate target letters, and for shooting all the targets. Extra bullets are obtained by shooting the numercial targets, but watch out for the "smileys" who are intent on stealing your bullets. Music, sound effects, hi-score, and rankings.

●●● *NEW RELEASE* ●●●

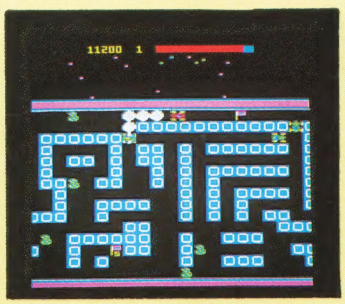
CENTIPEDE (32K) £7.95

Incredible arcade-style game featuring mushrooms, snails, flies, spiders, and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more lively and the number of mushrooms increases.

(For use with KEYBOARD or JOYSTICKS).

"Visually this game compares well with the arcade version, being colourful and clear."

. . . YOUR COMPUTER



ROAD RUNNER (32K) £7.95

The only full feature machine-code version available for the BBC micro. Features include: scrolling screen, radar display, 3 pursuing cars, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.

(For use with KEYBOARD or JOYSTICKS).

"The game becomes very hard and has very smooth graphics. Excellent." . . . BEEBUG MAGAZINE.

FROGGER (32K) £7.95

Not just another version of Frogger . . . this is the arcade-action version that you've been waiting to see. Graphically brilliant with gaping-mouthed crocodiles, diving turtles, flies, and frogs that flex their legs as they jump along. Increasing difficulty, and responsive controls.

(For use with KEYBOARD or JOYSTICKS).

". . . very good indeed . . . fast flicker-free graphics and a frog that really hops!" . . . BEEBUG MAGAZINE

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Personal Computing Today

VOLUME 2 NUMBER 6 JANUARY 1984

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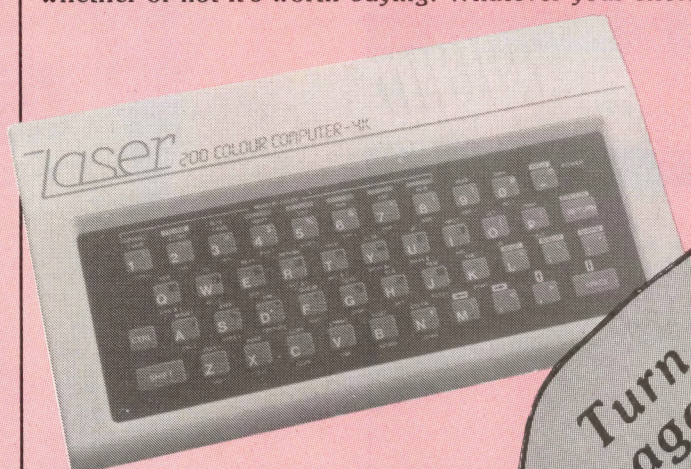
Now that the Christmas celebrations are over and your body is returning to normal after an orgy of over indulgence, may I welcome you to our January issue and wish you all a very happy and prosperous new year.

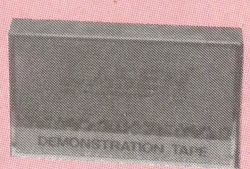
It will certainly be prosperous for at least one of you — the winner of our Christmas Crossword Competition, and we are looking forward to receiving lots of entries containing the correct answer to the brain teaser, which should have kept you well-occupied over the Christmas holidays.

To welcome in the new year, we bring you a test report of the new Laser 200 computer, which we had promised would appear in the December issue. Our technical hitch up was solved and we have prepared this ready for those of you with Christmas money to spend and are looking around for a computer. Before doing so, turn to the special review and also to our Hardware Factfile which will give you hints about which one to go for. Turn, also to our Add On Action section for news and reports of the many peripherals to add to your system.

Those of you who already own computers will be interested in the many programs for you to type in. This month we feature games and utilities for the **Atom, TI-99/4A** and **Atari** micros to name but a few and hints on conversion to other machines.

And for those of you still feeling too lethargic to type in your own program we bring you a round up of the latest commercial software on the market and tell you whether or not it's worth buying. Whatever your choice, have fun!





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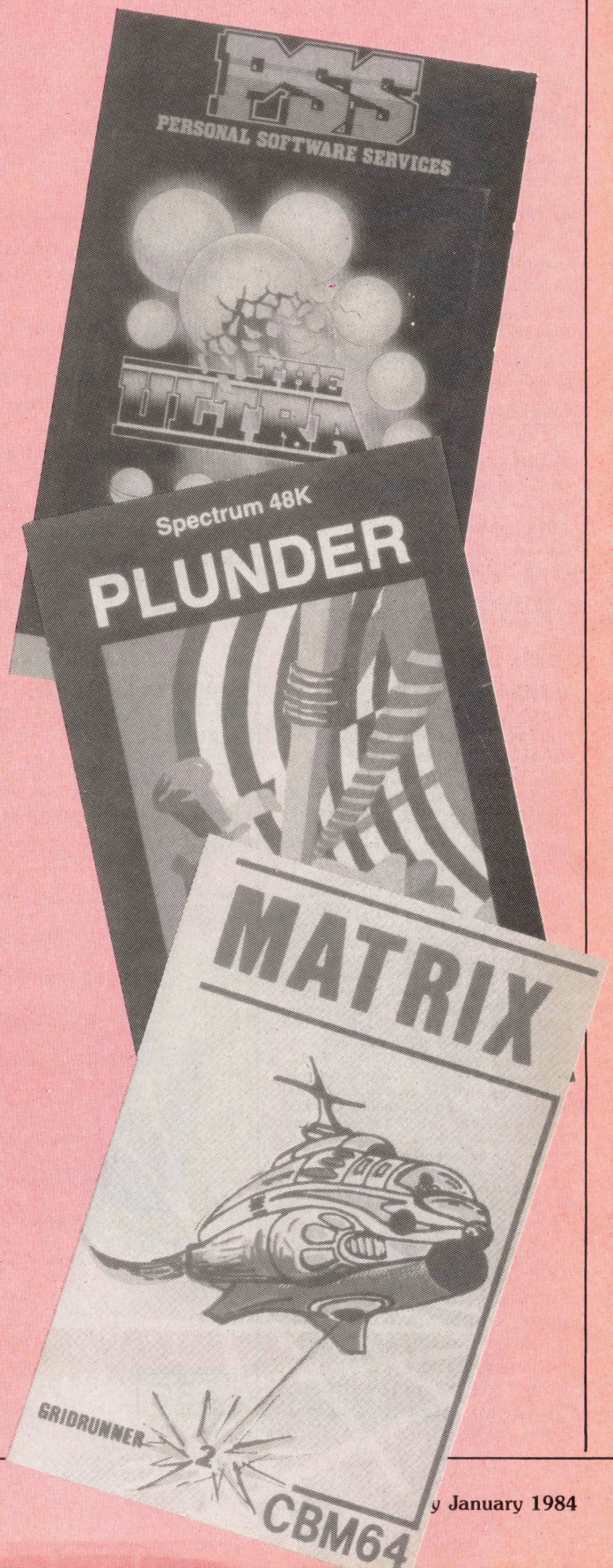

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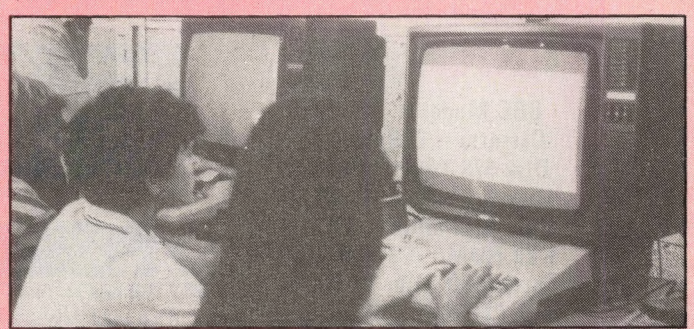

VIC 20 MICROSPOT

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REFERENCE

Hardware Factfile 97
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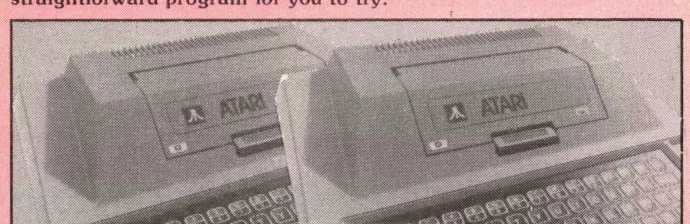
A good explanation of data input and information output and a straightforward program for you to try.



REFERENCE

Software Checklist 119
Another update has made this a comprehensive reference section on software for half the machines we cover.

REFERENCE

Micro Terms 134
Computer jargon translated into plain, simple English.

Home Computer - Starter Packs

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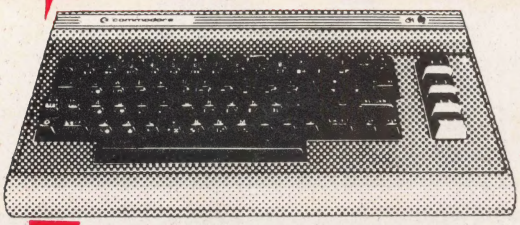

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NEWS NEWS NEWS

Printer in a matchbox

. . . Well, not quite but Brother have produced the world's smallest printer/typewriter, which is also probably the cheapest of the combined machines. The lightweight nifty little machine is a dot matrix thermal or ribbon printer with a comprehensive QWERTY keyboard and 12 digit calculator. The keyboard features a versatile second shift for accents and a range of signs for arithmetical or chemical formulae, including automatic superior and inferior numerals. It will even check that you put the accent over the right character!

Correction facilities include a 32 character 'buffer' and 16 character screen display with a cursor controlled insertion, deletion and overtype. Still more outstanding features are its 2K continuous memory which stores about a page of A4 text for corrections and remaining memory and most importantly for computer users, it is capable of interfacing with a computer's disc or tape memory.

Watch these pages closely, but until our review, note the price — recommended £169.95 but available in Argos shops for the amazine price of £119.

Cumana Comes On Strong

Cumana, leading floppy disc drive distributors, have developed their own slimline disc drives for the BBC and Dragon Microcomputers. These elegant 5¼ inch Japanese disc drives are available in single sided 40 and 80 track, and double sided 80 track formats. Each one has an easy-to-use manual door mechanics and heat dissipation without ventilation holes to prevent any risk of inquisitive young fingers poking screwdrivers into the electronics.

Cumana's design includes an independent power supply complete with mains power supply lead and plug — enabling up to two and four disc drives to be added to the BBC and Dragon microcomputers respectively without any modifications to the computer or risk of it overheating. Available from high street stockists.

Late Christmas Shopping. . . . . .

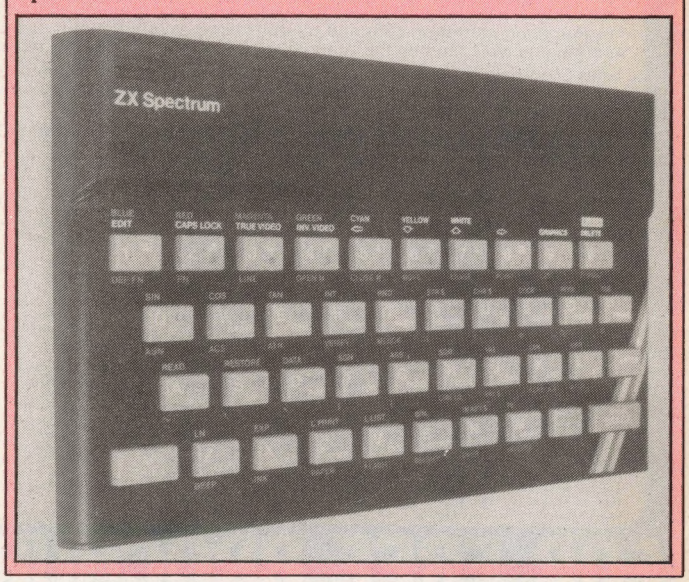
For any last minute panic buys The Personal *Computer Handbook* would be a good investment for micro-owners, indeed any interested parties.

Described as the foremost guide to the new home technology, this book by Helen Varley and Ian Graham gives comprehensive information about microcomputer elements, how they work and how to live with them and an interesting section on future technology. Bound is an attractive plastic cover, it offers good value at £5.95. Published by Pan and available from all good book sellers.

Spectrum to be Video Star

W. H. Smith are out to make a video programme featuring the Spectrum microcomputer. Their action is in response to increasing consumer demands for computer educational aids.

'Introduction to Programming' is the Company's first own-brand video title and is now available at larger branches around the country. Priced at £16.95 the video is available in two levels: level 1 for beginners, explaining Basic Programming by David Redclift, one of Britain's foremost programmers as well as four BASIC programs which can be transferred directly into the user's own computer. Level 2 features an introduction to the more advanced aspects of programming including array handling, string slicing and animation and two programs for transfer into the Spectrum.



Service For T199/4 and/4A Owners

Anyone requiring listings for programs written on these machines can get them quickly and efficiently from P.G. Brookes of Oxford. The service will cope with programs written in either TI or Extended BASIC, sent in on cassette or disc. Owners should specify whether the listing is for the 99/4 or /4A and whether they are in TI or Extended BASIC.

Other services are available and anyone interested should contact Mr Brooks on Oxford 71785 during normal office hours.

NEWS NEWS NEWS

Read While You Wait

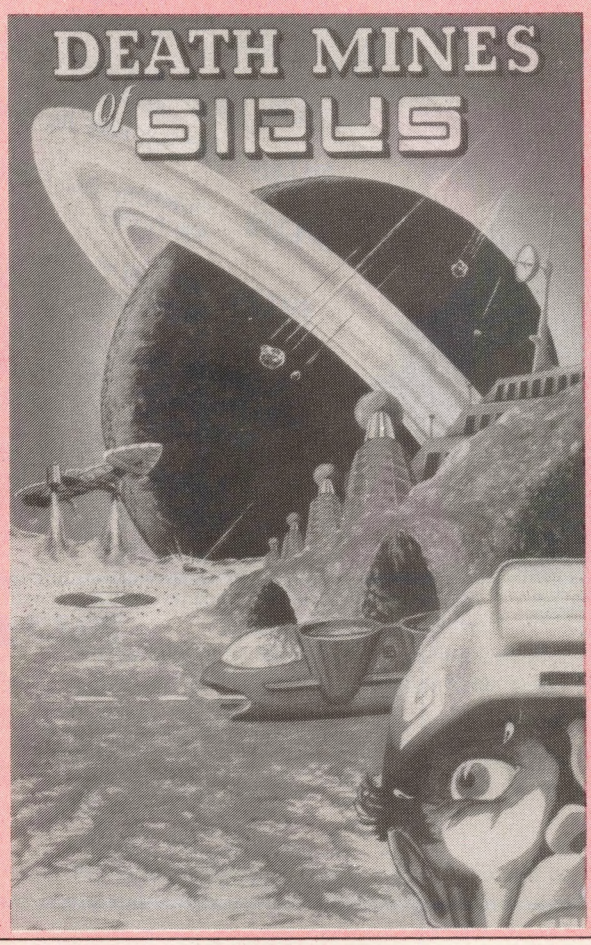
Whilst waiting to get hold of your promised Acorn Electron, you could while away the time by reading a new book telling you how to program it. **The Electron Programmer** by SM Geen and Mike James is published by Granada at the very reasonable price of £5.95. Then you'll know what to do with your machine when you get it!

Coordinate Your Brain Power

Phoenix Software are about to revolutionise arcade game playing by linking in the hand/eye coordination skills of players to more intellectually demanding tasks. Their twin cassette packs containing an exciting action game and an adventure game will retail at £9.99 each.

The action game has four skill levels, and at the end of each one a clue, vital to the solving of the adventure program, will be flashed on the screen. At the end of the fourth skill level, the player will be given the loading code for the adventure sequence. This way, action players have a purpose. No longer will they merely attempt to exceed a previous score. Now there is a target — the adventure program loading code.

For the adventure player, there is now the exciting obstacle of the action game to overcome. There are six games in the series which should be on the shelves of your high street computer store. Look out for our review of Death Mines of Sirus next month.



Explosion In Rabbit Population Expected After Merger With CBS

Due to an agreement between Rabbit Software and CBS, their software will now be available at all stockists of CBS records and videos. This comes at a time of rapid expansion in the Rabbit Software Company which has also recently extended distribution of its computer games into Boots, WH Smith and Rumbelows.

Master Of The Microdrive

Following hot on the heels of the launch of the long-awaited Sinclair ZX Microdrives comes a book to help you master the beast. Written by Andrew Pennell, a university student and programmer, and published by Sunshine Books, the book boasts to contain all the information you will ever need to use the ZX Microdrive to the full.

Covering streams and channels, file handling, program protection, the use of the RS232 Interface and machine language, the book is certainly comprehensive and promises to be good value at £6.95.

No Frying Tonight

Elkan Electronics have come up with a simple and novel safety device to prevent overworked and bleary eyed late night computer users, from drifting to the land of nod before switching off their machines. The device is also of tremendous help in preventing the over-eager from loading a cartridge or disc drive into the cartridge port of the machine while it is still switched on.

The aptly named Dragon's Eye on/off indicator enables you to tell quickly whether or not your machine is on. It is available for the Dragon and Tandy machines and is installed simply without any soldering. It costs £2.95 and is available from **Elkan Electronics, FREEPOST, 11 Bury New Road, Prestwick, Manchester (061-798-7613).**

Club Contacts

The contact for the Grimsby Computer Club has changed. Ian Lee is the new Membership Secretary and he can be reached on 0472 49248 or by writing to 28 Phelps Street, Cleethorpes. The club meets on alternative Monday evenings at St James School Assembly Hall, College Street at 7.30 p.m.

Aylesbury Computer Club have dropped the prefix 'ZX' and now cover all makes of home computer. The club continues to hold weekly meetings at Quarrendon School each Friday at 7.30 p.m. and monthly meetings at the Mandeville Centre. Further information by 'phoning David Nowotnik on Aylesbury 630867.

Oric Owners' Users' Group (International) Ltd is a newly formed group supporting the popular Oric-1 Microcomputer. Membership to this Group will cost £10.00 per year which will include 12 monthly issues of their magazine, 'Oric Computing'. New members will also receive, under the current promotional campaign, an Oric MCP 40 4 colour printer discount voucher to the value of £40.00 (see Add-ons for our review). For further information telephone 0934 510279.

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CHRISTINE COMPUTING FOR TI99/4A

6 FLORENCE CLOSE, WATFORD, HERTS WD2 6AS.
Tel: 09273 72941

HARDWARE

TI99/4A Computer (16 colours, 3 sounds + 1 noise, etc) **£104.95**

TI compatible cassette recorder £24.98, interface leads single recorder **£4.35,** Dual recorder **£5.45.**

Recorder and single lead £28.75, Recorder and dual lead **£29.75.**

Computer + Recorder + single lead **£133.50.**

Speech Synthesizer **£44.95.** 32K ram expansion (requires either Extended Basic or Mini memory), stand alone **£125,** Periferal Base Mounting **£110.**

Cartridge Software

A-Maze-ing **£12.95,** Alpiner **£21.25,** Chess **£29.50,** Extended Basic **£51.50,** Home Budget Management **£21.25,** Invaders **£17.50,** Mini Memory **£51.50,** Munch Man **£24.00,** Music Maker **£24.00,** Parsec **£23.50,** Personal Record Keeping **£33.95.**

Cassette Software

Blast It: disarm bombs with wire guided robot 5 levels of play etc **£3.50**

CORE! disend to the core avoiding objects as you go, 3 stages etc **£3.50**

SPUDZ: collect potatoes before the sun sets, 4 levels of play etc **£3.50**

SIR Slurp-A-Lot sip as many drinks as you can before closing time **£4.95**

Croc-Ward a hangman variant keeps kids amused for hours **£4.95**

SEE US AT YOUR COMPUTER XMAS FAIR DEC 15–18th

All prices inclusive, Cheques PO's to above address or 50p for full illustrated list (refunded on 1st order).

NEXT MONTH

Memotech MTX

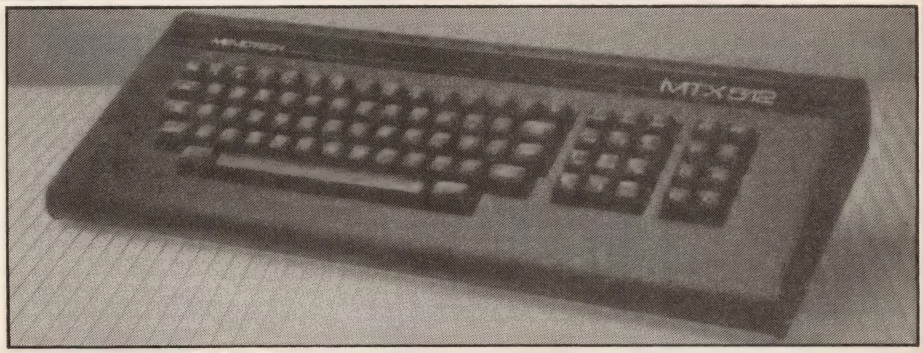
Flying the flag for Britain in the competitive home computer and small business machine market, Memotech have recently launched their MTX range of personal and professional micros.

Manufactured in Oxfordshire, there are two machines in the range, the MTX512 which has 64K of RAM and the MTX500 with 32K. We have managed to get our hands on the larger machine and after a full investigation will be reporting our findings in the February issue of Personal Computing Today.

Both machines are fully expandable to 512K allowing the machine's use for personal programming, games playing, scientific or process control, educational or business use. There are several languages and routines present in the 24K ROM enabling the novice or experienced programmer to make full use of the machine.

Sixteen colours and 40 column text, are just two of the standard functions available on the machines. The outputs include a centronics printer port, two joystick ports, 2400 Baud Cassette part and separate TV and Video Monitor ports.

So for such competitive prices as £315 and £275 the Memotech machines promise to be interesting packages, so order your February copy of *Personal Computing Today* from your newsagent now using the coupon below.



Little Brother

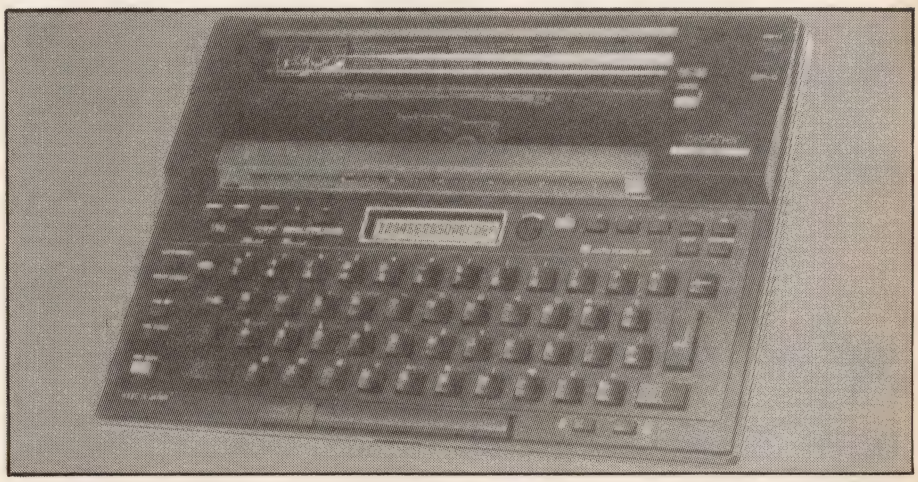
A remarkable printer/typewriter has recently broken onto the computer scene. The EP-22 from Brother Limited is a lightweight, briefcase-sized machine which can be used as a typewriter/calculator or which may be interfaced to a computer.

It features a dot matrix printout onto plain or thermal paper, 1K of memory and a small screen giving a 16 digit readout, so if used as a typewriter, you can check the text before printing it out and hence have perfect copies everytime!! One of the most remarkable things about it is the price — at a recommended retail price of £169 for a computer printer, the larger machines had better watch out. We'll be giving you the ins and outs of this unit next month.

And more.....

An usual we'll have a terrific selection of programs for you to type into your machines, along with lots of explanations and hints on how to convert to other micros.

News, views and reviews of the latest happenings on the computer market will keep you right up to date with the micro world.



Personal Computing Today

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YOUR MICRO COULD TEACH YOU A THING OR TWO ABOUT THE FRENCH...

...OR THE GERMANS...OR THE SPANISH

A home computer is an expensive toy; and, if playing games is all you do with it, a toy is all it is.

Now, using the New Personal Computer Superlearning System (PCSS) you can have fun with your micro and learn something at the same time.

PCSS language courses comprise 12 lessons on 3 audio cassettes used in conjunction with a fourth software cassette, to add a new dimension to learning.

Initially the software package enables you to see the words you're learning; then, as your vocabulary develops, it will test your skill in your new language.

Anyone can learn this way – no previous knowledge of the language is required. The unique PCSS method develops your overall learning and memory skills in a way thats both relaxing and enjoyable.

Each PCSS language pack – French, German or Spanish – contains a comprehensive booklet detailing the 12 audio lessons and the function of the interactive software. Additionally the booklet expands on the broader benefits of the PCSS method.

At only £29.95 per pack PCSS costs less than other home language courses yet it offers much more in terms of education and enjoyment.

Complete the coupon below and try PCSS for yourself – you'll be amazed what your micro can teach you.

MDA

COMPUTERISED EDUCATION SYSTEMS

(PCSS software is compatible with the ZX81 (16K), ZX Spectrum, BBC Micro, Acorn Electron Micros.)

Each pack comes with a full money back guarantee if not completely satisfied.

Send your cheque or Postal Order for **£29.95** made payable to: **MDA Modon Associates Limited, 561 Upper Richmond Road West, London SW14 7ED.**

or, alternatively phone **Teledata 01 200 0200** now, lines open 24 hours and quote your Visa, Diners Club, Access or American Express number.

Tick which Audio/software package you require. (Prices include VAT. Add £1.45 for postage and packing on each order.)

Please supply the following Audio/software Packages PCT 1

FRENCH ☐ GERMAN ☐ SPANISH ☐

Name:_____

Address:_____

_____

Machine Type:_____ Memory Size:_____

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All tapes carry a DATAFILE program that enables the user to INPUT-EDIT-SAVE-READ data on tape.

TAPE I	: Descriptive Statistics	6.99
TAPE II	: Statistical Tests	14.95
TAPE III	: Probability Distribution	14.95
TAPE IV	: Multivariate Datafile Cross-tabulations and correlation coefficients	14.95
TAPE V	: Step-Wise Multiple Regression and Analysis of Variance in Regression	19.95
TAPE VI	: Principal Components	19.95
TAPE VII	: Factor Analysis	19.95
TAPE VIII	: Time Series and Forecasting	19.95

Statistical Library	100.00
BBC-Model B (disk)	125.00
BBC-B and Spectrum-48K (8 tapes)	100.00
ZX-81 (7 tapes without Datafile)	70.00

Saga Software House

Scientific and Business Packages for BBC-Model B, Spectrum-48K, ZX-81(16K)

133A High Street, Acton

LONDON W3 6LY

PCT

'NOW WIN THE POOLS'

THIS IS MEANT FOR **YOU** — ESPECIALLY IF YOU USE A SINCLAIR ZX81 or SINCLAIR SPECTRUM COMPUTER, or even ANY COMPUTER.

HAVE YOU EVER HAD THAT DREAM OR EVER WISHED THAT YOU HAD "WON ON THE POOLS" — AT LAST YOU CAN TURN IT INTO REALITY.

THERE **IS** A SECRET OF "HOW TO WIN ON THE FOOTBALL POOLS" — **IT CAN BE DONE.** I DISCOVERED THE SECRET A LONG TIME AGO — NOW, **FOR THE FIRST TIME** I'M PREPARED TO SHARE IT WITH YOU.

HOW DOES THIS INTEREST YOU — I HAVE DOCUMENTARY EVIDENCE BY WAY OF POOLS WINNINGS DIVIDEND SLIPS/ CANCELLED CHEQUES, etc, SHOWING MY PRESENT WINS ON THE POOLS AS FOLLOWS:—

First Dividends	Second Dividends	Third Dividends	Fourth Dividends	Fifth Dividends	Sixth Dividends
765	1,818	2,942	1,952	631	93

A GRAND TOTAL OF 8,201 (EIGHT THOUSAND, TWO HUNDRED AND ONE DIVIDENDS — so far).

I HOLD THE UNCHALLENGED WORLD'S RECORD FOR POOLS WINS

Do not let anyone tell you that it is impossible to "WIN ON THE POOLS" — since I perfected my method, **I HAVE WON REGULARLY** for over **TWENTY-FIVE YEARS** — proof that it is no 'flash-in-the-pan'.

I have CHALLENGED THE WORLD with my record of wins and with all the evidence that I possess — NO ONE has ever been able to accept the Challenge — I KNOW NO ONE EVER WILL.

MY SECRET IS NOW PLACED ONTO COMPUTER CASSETTE FOR YOU.

THE METHOD IS THE GREATEST TREBLE CHANCE WINNER IN THE HISTORY OF FOOTBALL POOLS — IT WILL LAST FOREVER — BOTH FOR ENGLISH AND AUSTRALIAN FOOTBALL POOLS, WITH EQUAL SUCCESS.

I now intend to give a limited number of people the opportunity of making use of my method — perfected over 25 years and proving itself on **EVERY ONE OF THOSE TWENTY-FIVE YEARS.**

You will have noted details of my personal achievements so far, as given to you above.

A GRAND TOTAL of 8,201, yes 8,201 POOLS DIVIDENDS, including **765 FIRST DIVIDENDS.**

My Pools Winnings Dividend slips now number so many, that they fill a very large suitcase and will stand as my evidence of all claims in **ANY COURT OF LAW IN THE WHOLE WORLD.**

Taking just the past 25 years into consideration, I have won ON AVERAGE over 328, (THREE HUNDRED AND TWENTY—EIGHT) Pools Dividends **EVERY YEAR** — or — AN AVERAGE of over **SIX DIVIDENDS EVERY WEEK** for **TWENTY—FIVE YEARS.**

You have my absolute Guarantee of the complete authenticity of every claim, cheque, document, letter, etc, contained herein.

I do have losing weeks, but ON AVERAGE my winnings show over SIX DIVIDENDS **EVERY WEEK** for the past 25 years.

I know that you are now utterly flabbergasted, it always happens to everyone with whom I come into contact. Please just sit back and **imagine** for a moment my **FIRST DIVIDEND** wins alone — they now number 765 (seven hundred and sixty-five) and will probably be even more by the time this advertisement appears in print.

I AM NUMBER ONE IN THE WORLD AND NO ONE DISPUTES IT.

For as long as I continue to enter the Football Pools my wins will continue. I have already said, they apply, with equal success to both English and Australian Football Seasons.

I intend to release a STRICTLY LIMITED NUMBER of copies of my cassette, (either for Sinclair ZX81 or Sinclair Spectrum) — DO NOT DELAY AND FIND YOU ARE TOO LATE, in which case I would have to refund your money.

I am so confident of **YOUR** success that if do **not** win at least THREE FIRST TREBLE CHANCE DIVIDENDS in the first 20 weeks of entering, I will completely cancel the balance of the purchase price and you do not have to pay me another penny, at any time, no matter how vast your winnings.

I only wish that space would allow me to give you photographs of my winnings slips, cancelled cheques, etc, but it is of course impossible — they now number 8,201 dividends. I have however given JUST A FEW EXTRACTS from ORIGINAL LETTERS I hold from my small Clientele.

I am the Inventor and Sole Proprietor of my method, Registered as EUREKA — ('I have found it'). I am known as The Professor in Pools Circles — I am of the Highest Rank in Forecasting — this is beyond dispute. I am marketing a limited number of Computer Cassettes, under my Registered Company — FOOTBALL ENTERPRISES.

My initial charge for a copy was £75, but for this SPECIAL REDUCED PRICE OFFER I will send you a copy, (for ZX81 or Spectrum) for £20, (twenty pounds) ONLY, plus your Promise to pay me the balance of £55 — **ONLY** IF YOU WIN AT LEAST THREE FIRST TREBLE CHANCE DIVIDENDS IN YOUR FIRST 20 WEEKS OF ENTERING — otherwise you owe me NOTHING FURTHER.

This is surely proof absolute of my supreme and utter confidence in my own abilities and in the capabilities of my discovery. I could easily CHARGE £2,000 per cassette on the evidence I possess, but that would not be fair to everyone, which is what I want to do.

My method is WORLD COPYWRIGHT, any infringement and immediate proceedings will be taken, without prior warning. It is truly ingenious and has stood the test of time.

My cassette is simplicity itself to operate and you'll be given FULL DETAILS for weekly calculating. Your entry need not involve you in any large weekly stakes, you can enter for as little as 25p, if you wish.

I charge NO COMMISSION on any of your wins — no matter how BIG they may be.

I realised a long time ago, that it was no good sitting down and **dreaming** about winning the pools, so I burnt the candle at both ends, working late into the night, occasionally RIGHT THROUGH THE NIGHT, I **KNEW** there was a way, eventually it all paid off and has been doing so ever since.

I am unable to vary my offer to anyone, so please do not request it, as I shall very easily dispose of the cassettes I have prepared and am making available.

IMMEDIATELY I perfected my method I commenced winning right away, (first with just a little £163, the first week I used it), I HAVE NEVER LOOKED BACK SINCE, amongst all those dividends was one for over **EIGHT THOUSAND POUNDS** for just **one eighth of a penny stake.**

I will release a copy on cassette, to you, on receipt of the completed order form and your Signature thereon, confirming you will treat it in the STRICTEST CONFIDENCE between us and retain it for your **OWN USE ONLY.**

PLEASE NOTE:
If you happen to be the proud owner of a Computer, **other than** a Sinclair ZX81 or Sinclair Spectrum, you can still purchase a copy of my method, for the same price and program it YOURSELF on to YOUR OWN COMPUTER.

Don't take my word for it, read what people write about me and my method:—

I won on Zetters last weekend. It was not a big sum, but all the same it was a very nice surprise for me. J.C., Lancs.

I appreciate the straightforward method you adopt, which is such a contrast to the rubbish of misrepresentation which is so common in the Betting World, by unscupulous and self-opinionated charlatans. C.H., Devon

Winnings cheque received today, sincere thanks. D.N., Devon

I congratulate you on your achievement. R.R., Wales

I should like to thank you for a most exciting season and look forward to hearing from you again. J.C., Hants.

I would like to acknowledge cheque and say how much I appreciate your integrity. J.M., Scotland

Many thanks for your system, it is all you say and more. J.C., Lancs.

Your wonderful system won me £3,527. I intend to visit London soon and will be able to come and see you personally. (Overseas Client). P.M., Kampala.

Many thanks for trying so hard to please us all, your brother should be thanked also. One of our daughters, WHOSE HUSBAND YOU HELPED ENORMOUSLY, has just phoned, the four of them have just spent a lovely holiday in Spain. K.R.,Isle of Man.

I sent in my FIRST entry last week and won 2nd and 3rd dividends, as you will see from the enclosed certificate. One more and I would have collected over £400 for FIRST dividend. Once I've won a fair amount I shall be staking from winnings and at 2p per line, A FIRST DIVIDEND last week at this would have been over £3,000. C.A., Yorks.

I am very interested indeed and enclose £20 herewith. I agree to pay you the balance of £55 **ONLY** if I win at least THREE FIRST TREBLE CHANCE DIVIDENDS in my first 20 weeks of entering — otherwise I owe you NOTHING FURTHER at any time — no matter how much money I win. My Signature below is my Undertaking to retain complete and absolute confidence about the method.

Name.....

Address.....

.....

.....

Signature ..... PCT 1

The Managing Director,
Football Enterprises,
'Anvon',
9 New Road,
Haverfordwest, Pembs.

Please tick if cassette is for:
Sinclair ZX81 (16K) ☐
Sinclair Spectrum (48K) ☐
Any other Computer ☐

SOFTWARE

REVERSI

Turn your life upside down with this game of strategy specially written for the 48K Oric by Alan Northcott.

Reversi is a board game of tactical skills invented at the turn of the century. It was later 're-invented' and called Othello.

The game has been written in program form for one or two players. When input into your Oric a grid will appear onto which the players must place their pieces in an effort to 'capture' the ones of their opponent's. The strategy comes in when deciding where to place your piece. One of your counters either side of your opponent's (in any direction) allows you to convert your opponent's piece to one of your own. The game ends when one player has all the pieces on the board. It is obviously harder to describe than to play but it is a fascinating and absorbing game.

List of Variables used:

X,Y (Value 1-8)	Used generally in board setup, then to pass position to piece drawing routine
XC,YC (1-8)	Position of cursor used during player input
NX,NY (1-8)	New square under consideration in moving/taking routine
LX,LY,HX,HY (1-8)	Limits of initial consideration, to speed move
DX,DY (-1.0 or1)	Give direction from new square. . .
DIST	. . .and associated distance from new square
XBEST,YBEST (1-8)	'Best' playing position found (so far)
PTS	Points 'scored' by that position
SCRE	Points 'scored' by currently considered position.
WHITE,BLACK (1 or 2)	1 for computer playing that colour. 2 for player.
WP,BP	Number of white and black pieces
TAKE	Taking power of a move (no of pieces)
VIB	Period of SOUND commands
VAR	Change in pitch
T(X,Y)	Tactics array with a value for each square
BOARD(X,Y)	Board array, 1 = Empty square, 2 = White 3 = Black
Also used:—	N,TURN,ENEMY,A$,PL$,Z,COLOUR$

Boolean Variables:-
MOVING is TRUE when calling the taking routine to move a piece, FALSE when only requiring a value returned in TAKE.
GAMEOVER is TRUE if there are no moves left, or the board is full, or end requested.
LEGAL is made FALSE if there is no legal move for a player
QUIET is TRUE if no sound is required.

ORIC

REVERSI

HOW IT RUNS

Lines 10-30	Set screen and HIMEM stops character corruption
Lines 40-50	Display title in double-height, without cursor
Line 60	Goto routine to read tactical values
Lines 70-80	Goto instructions, if required
Lines 90-150	Ask and set if sound required
Line 160	Goto routine to set starting position
Line 170	Goto routine to determine number (type) of players
Line 180	Starts playing loop
Lines 190-225	Black's turn
Line 195	Displays score
Line 200	Checks for legal move and jumps if none
Lines 210-220	Make or get Black's move
Lines 230-260	White's turn — as Black's
Line 270	End of game
Lines 280-320	Another game or end
Line 1000	TAKE will be set to number of pieces captured by moving to NX, NY
Lines 1010-1020	For each direction in turn
Lines 1030-1050	. . . at increasing distance DIST
Line 1060	. . . until no longer enemy pieces
Line 1070	No enemy pieces encountered
Line 1080	Ensure next piece is own
Lines 1090-1210	Section to capture taken pieces
Lines 1120-1150	Set limits of move search
Lines 1220-1230	Next direction
Lines 2000-2460	Display two screens of instructions
Lines 3000-3130	Enter tactical values, read from the data statements, into the T(X,Y,) array. The values, which are open to experimentation, range from 10 for the valuable corner, down to 0 & 1 for those squares adjacent to the corner, which may give it away.
Line 4000	Initialises HI RES display
Line 4010	Sets SOUND variables
Lines 4020-4090	Draw the board
Lines 4100-4140	Set all elements of the array BOARD (X,Y), which holds the current position, to 1 (empty).
Lines 4150-4190	Draw starting position
Line 4200	Number of pieces
Line 4210	Limits of move search
Line 5000-5020	Determine number of players
Lines 5030-5040	Computer plays itself
Lines 5050-5060	Two players
Lines 5070-5110	One player select colour
Line 6000	Not moving yet
Line 6010	PTS (points) for the position set to an arbitrarily low figure
Lines 6020-6030	Considering each square in turn
Line 6040	If not empty, then skip
Lines 6050-6060	Determine taking power (if zero, skip)
Line 6070	Move evaluation — the move is scored according to the tactical value T(X,Y), a random element to give variation, the number of pieces taken by the move and the total played. TAKE *(XP + YP-32) is negative in the first half of the game, thus discouraging high taking moves early on, which are generally thought to be disadvantageous, and increasingly positive subsequently, to encourage higher takes towards the end. The evaluation is easily altered to change the importance of each element, and it is interesting to see the variation in style of play that can be achieved.
Lines 6080-6120	If best score so far, then the move is saved in XBEST, YBEST.
Lines 6130-6150	Call subroutine with MOVING = TRUE, to make the 'best' move
Lines 6155-6210	Option to interrupt game, as detailed in the instructions
Lines 7000-7060	Flash 'cursor', awaiting for a key press
Lines 7070-7110	Identify and act on cursor keys
Line 7120	RETURN pressed, go to moving part of routine
Lines 7130-7160	Game options
Lines 7170-7230	Check that the input move is valid then move it
Lines 8000-8100	Take each empty square in turn until a legal move is found, then make LEGAL = TRUE
Lines 9000-9100	Draw a white piece at X,Y
Lines 9010-9040	Sound
Lines 9050-9070	Draw 10 concentric circles
Lines 10000-10120	Draw a black piece at X,Y
Lines 10010-10040	Sound
Lines 10050-10070	Draw 9 concentric circles in background colour
Line 10080	Draws outer edge
Lines 11000-11040	Routine to display double height messages on bottom 3 lines in HI RES mode, with the previous message displayed (single height) above, as a reminder.

PROGRAM LISTING

```
0 REM*******(******(*******(**********
1 REM**                            **
2 REM**       ORIC REVERSI         **
3 REM**                            **
4 REM**       Alan Northcott       **
5 REM**                            **
6 REM**         May 1983           **
7 REM**                            **
8 REM************************************
10 CLS
20 TEXT
25 HIMEM#9800
30 PAPER1:INK7
40 PRINT:PRINT:PRINT:PRINT,,;
50 POKE#26A,90:PRINT"J  ORIC REVERSI"
60 PRINT:PRINT:PRINT:GOSUB3000'Tactics
70 PRINT,CHR$(27);"J Do you need instructions?"
80 A$=KEY$:IFA$="Y"THENGOSUB2000E~SEIFA$<>"N"THENGOTO80
90 CLS:PAPER0:INK2
100 PRINT:PRINT:PRINT
110 PRINT,,CHR$(27);"J Do you want sound?"
120 A$=KEY$
130 IFA$="Y"THEN QUIET=FALSE:GOTO160
140 IFA$="N"THEN QUIET=TRUE:GOTO160
150 GOTO120
160 GOSUB4000'Set up initial position
170 GOSUB5000'Number of players
180 REPEAT
190 : TURN=3:ENEMY=2
195 : M1$="SCORE: Black "+STR$(BP)+" - White "+STR$(WP):GOSUB11000
200 : GOSUB8000:IFLEGAL=FALSETHENM1$="Black has no move":GOSUB11000
:GOTO 225
210 : M1$="Black's move":GOSUB11000
220 : ON BLACK GOSUB 6000,7000
225 : IFGAMEOVERTHEN270
230 : TURN=2:ENEMY=3
235 : M1$="SCOPE: Black "+STR$(BP)+" - White "+STR$(WP):GOSUB11000
240 : GOSUB8000:IFLEGAL=FALSETHENM1$="White has no move":GOSUB11000
:GOTO270
250 : M1$="White's move":GOSUB11000
260 : ON WHITE GOSUB 6000,7000
270 UNTIL GAMEOVER
280 M1$="Another game?":GOSUB11000
290 A$=KEY$:IFA$=""THEN290
300 IFA$="Y"THEN160
310 IFA$<>"N"THEN280
320 TEXT:END

999 REM SUBROUTINE TO RETURN THE TAKING POWER OF A MOVE
1000 TAKE=0
1010 FOR DX=-1 TO 1
1020 :  FOR DY=-1 TO 1
1030 :    DIST=0
1040 :    REPEAT
1050 :      DIST=DIST+1
1060 :    UNTIL BOARD(NX+DX*DIST,NY+DY*DIST)<>ENEMY
1070 :    IF DIST=1 THEN 1220'NO TAKE IN THAT DIRECTION
1080 :    IF BOARD(NX+DX*DIST,NY+DY*DIST)<>TURN THEN 1220ELSETAKE=T
AKE+DIST-1
1090 : ~  IF NOT MOVING GOTO 1220
1100 :    IF TAKE<>DIST-1 THEN 1180
1108 :    X=NX:Y=NY
1120 :    IF X=LX THEN LX=X-1:IF LX=0 THEN LX=1
```

```
1128 :     IF X=HX THEN HX=X+1:IF HX=9 THEN HX=8
1140 :     IF Y=LY THEN LY=Y-1:IF LY=0 THEN LY=1
1150 :     IF Y=HY THEN HY=Y+1:IF HY=9 THEN HY=8
1160 :     ON TURN-1 GOSUB 9000,10000
1170 :     IF TURN=3THEN WP=WP+1 ELSE BP=BP+1
1180 :     FOR Z=1 TO DIST-1
1190 :        X=NX+DX*Z:Y=NY+DY*Z
1200 :        ON TURN-1 GOSUB 9000,10~00
1210 :     NEXT Z
1220 :  NEXT DY
1230 NEXT DX
1240 RETURN

1999 REM INSTRUCTIONS
2000 PRINTCHR$(4);CHR$(12)'Single height, clear screen
2010 PRINT
2020 PRINT" The game of Reversi, or Othello as"
2030 PRINT"it is now know~, is played on an 8x8"
2040 PRINT"board, play alternating until the"
2050 PRINT"board is full, or no move by either"
2060 PRINT"player is possible. If a player has"
2070 PRINT"no legal move, his turn is forfeit."
2080 PRINT" A move consists of 'placing' a piece"
2090 PRINT"on the board, next to an opponent's"
2100 PRINT"piece, so that the opponent's piece"
2110 PRINT"or pieces are trapped in a straight"
2120 PRINT"line between the newly placed piece"
2130 PRINT"and a player's piece already on the"
2140 PRINT"board. The piece(s) so trapped become"
2150 PRINT"the player's. Pieces may be captured"
2160 PRINT"both orthogonally and diagonally in"
2170 PRINT"several directions in the same move."
2180 PRINT" When the game is over, the player"
2190 PRINT"with the most pieces on the board is"
2200 PRINT"the winner."
2210 PRINT:PRINT"     PRESS ANY KEY TO CONTINUE"
2220 A$=KEY$:IFA$=""THEN2220
2230 PRINTCHR$(12):PRINT
2240 PRINT" To place a piece, move the flashing"
2250 PRINT"cursor to the required square using"
2260 PRINT"the arrow keys, then play by pressing"
2270 ~RINT"<RETURN> when the cursor is in the"
2280 PRINT"required position."
2290 PRINT:PRINT" You may choose 0,1 or 2 (human)"
2300 PRINT"players : -"
2310 PRINT"     0 - for demonstration, the"
2320 PRINT"  computer plays itself"
2330 PRINT"     1 - to play against the computer"
2340 PRINT"     2 - for a computer-moderated"
2350 PRINT"  game between two players, with"
2360 PRINT"  checks for legal moves and"
2370 PRI~T"  automatic scoring."
2380 PRINT:PRINT" Finally, pressing the following keys"
2390 PRINT"at any time will have the stated"
2400 PRINT"effect (after the move is complete):-"
2410 PRINT"  S - to stop temporarily, (press any"
2420 PRINT"       key to continue)"
2430 PRINT"  N - to start a new game"
2440 PRINT"  E - to end play."
2450 PRINT:PRINT"     PRESS ANY KEY TO START";
2460 A$=KEY$:IFA$=""THEN2460ELSEPRINTCHR$(4):RETURN

2999 REM ENTER TACTICAL VALUES
3000 FOR X=1TO4
3010 :  FORY=1TO4
3020 :     READ TACTIC
3030 :     T(X,Y)=TACTIC
3040 :     T(X,9-Y)=TACTIC
3050 :     T(9-X,9-Y)=TACTIC
3060 :     T(9-X,Y)=TACTIC
3070 :  NEXTY
3080 NEXTX
3090 DATA10,1,7,5
3100 DATA1,0,2,2
3110 DATA7,2,4,3
3120 DATA5,2,3,3
3130 RETURN

3999 REM SET UP BOARD AND DISPLAY
4000 HIRES:INK7:POKE#26A,10
4010 VIB=1500:VAR=1.06:M2$=""
4020 FOR X=25TO217 STEP24
4030 :  CURSETX,4,3
4040 :  DRAW0,191,1
4050 NEXTX
4060 FORY=4TO196STEP24
4070 :  CURSET25,Y,3
4080 :  DRAW191,0,1
4090 NEXTY
4100 FORX=1TO8
4110 :  FORY=1TO8
4120 :     BOARD(X,Y)=1' EMPTY SQUARE
4130 :  NEXTY
4140 NEXTX
4150 FORZ=4TO5
4160 :  X=Z
4170 :  Y=Z:GOSUB9000'DRAW WHITE
4180 :  Y=9-X:GOSUB10000'DRAW BLACK
4190 NEXTZ
4200 BP=2:WP=2
4210 LX=3:HX=6:LY=3:HY=6
4220 GAMEOVER=FALSE
4230 RETURN

4999 REM No & TYPE OF PLAYERS
5000 M1$="How many players?":GOSUB11000:GETPL$
5010 IF PL$<"0"ORPL$>"2"THENM1$="Enter 0,1 or 2":GOSUB11000:GOTO500
0
5015 M2$=M2$+"  "+PL$
5020 ONVAL(PL$)+1GOTO5030,5070,5050
5030 BLACK=1:WHITE=1'COMP.PLAYS BOTH
5040 RETURN
5050 BLACK=2:WHITE=2'TWO PLAYERS
5060 RETURN
5070 M1$="Will you play black or white?":GOSUB11000
5080 GET COLOUR$
5090 IF COLOUR$="B"THENBLACK=2:WHITE=1:M2$=M2$+" Black":RETURN
5100 IF ~OLOUR$="W"THENBLACK=1:WHITE=2:M2$=M2$+" White":RETURN
5110 GOTO5070

5999 REM COMPUTER'S MOVE
6000 MOVING=FALSE
6010 PTS=-1000
6020 FOR NX=LX TO HX
6030 :  FOR NY=LY TO HY
6040 :     IF BOARD(NX,NY)<>1 THEN 6110
6050 :     GOSUB 1000
6060 :     IF TAKE=0 THEN 6110
6070 :     SCRE=T(NX,NY)*20+RND(1)*10+TAKE*(XP+YP-32)'EVALUATE MOVE
6080 :     IF SCRE<PTS THEN 6110
6090 :     PTS=SCRE
6100 :     XBEST=NX:YBEST=NY
6110 :  NEXT NY
6120 NEXT NX
6130 NX=XBEST:NY=YBEST
6140 MOVING=TRUE
6150 GOSUB 1000
6155 IF BP+WP=64 THEN GAMEOVER=TRUE
6160 A$=KEY$:IFA$=""THENRETURN
6170 A=ASC(A$)
6180 IFA=83THENM1$="Press any key to re-start":GOSUB11000:GETA$:RET
URN
6190 IFA=78THEN GAMEOVER=TRUE:RETURN
6200 IF A=69 THEN TEXT:END
6210 RETURN

6999 REM ROUTINE TO INPUT PLAYER'S MOVE
7000 CURSET XC*24+10,YC*24-11,3
7010 CHAR126,0,1
7020 WAIT5
7030 CHAR126,0,0
7040 WAIT5
7050 A$=KEY$:IF A$="~"THEN7010
7060 IFBOARD(XC~YC)=2THEN ~HAR126,0,1
7070 A=ASC(A$)
7080 IF A=8 THEN XC=XC-1:IF XC<1THENXC=1
7090 IF A=9 THEN XC=XC+1:IF XC>8THENXC=8
7100 IF A=10THEN YC=YC+1:IF YC>8THENYC=8
7110 IF A=11THEN YC=YC-1:IF YC<1THENYC=1~
7120 IF A=13 AND BOARD(XC,YC)=1THEN 7170
7130 IFA=83THENM1$="Press any key to re-start":GOSUB11000:GET A$:GO
TO7010
7140 IF A=78 THEN GAMEOVER=TRUE:RETURN
7150 IF A=69 THEN TEXT:END
7160 GOTO7000
7170 NX=XC:NY=YC
7180 GOSUB 1000
7190 IF TAKE=0 THEN 7000
7200 MOVING=TRUE
7210 GOSUB 1000
7220 IF BP+WP=64 THEN GAMEOVER=TRUE
7230 RETURN
7999 REM ROUTINE TO CHECK FOR A LEGAL MOVE
8000 MOVING=FALSE:TAKE=0
8010 FOR NX=LX TO HX
8020 :  FOR NY=LY TO HY
8030 :     IF BOARD(NX,NY)<>1THEN8060
8040 :     GOSUB 1000
8050 :     IF TAKE<>0THEN XC=NX:YC=NY:NX=8:NY=8
8060 :  NEXT NY
8070 NEXT NX
8080 IF TAKE<>0 THEN LEGAL=TRUE:RETURN
8090 IF LEGAL=FALSE THEN GAMEOVER=TRUE ELSE LEGAL=FALSE
8100 RETURN

8999 REM DRAW A WHITE AT X,Y
9000 CURSETX*24+13,Y*24-8,3
9010 VIB=INT(VIB/VAR)
9020 IF QUIETTHEN9050
9030 SOUND1,VIB,0
9040 PLAY 1,0,1,1000
9050 FORN=1TO10
9060 :  CIRCLEN,1
9070 NEXTN
9080 BOARD(X,Y)=2
9090 WP=WP+1:BP=BP-1
9100 RETURN
9110 RETURN

9999 REM DRAW A BLACK AT X,Y
10000 CURSETX*24+13,Y*24-8,3
10010 VIB=INT(VIB*VAR)
10020 IFQUIETTHEN10050
10030 SOUND1,VIB,0
10040 PLAY 1,0,1,1000
10050 FORN=1TO9
10060 :  CIRCLEN,0
10070 NEXTN
10080 CIRCLE10,1
10090 BOARD(X,Y)=3
10100 BP=BP+1:WP=WP-1
10120 RETURN

10999 REM ROUTINE USED FOR BOTTOM 3 LI~ES - TO GIVE DOUBLE-HEIGHT M
ESSAGES
11000 PRINT:PRINT"  ";M2$
11010 PRINTCHR$(138)+"  "+M1$
11020 PRINTCHR$(138)+"  "+M1$;
11030 M2$=M1$
11040 RETURN
```

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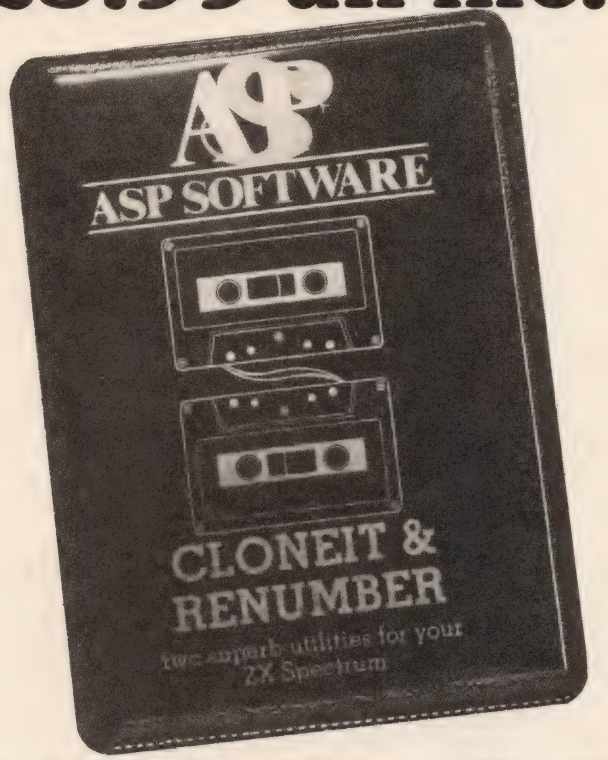

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NIGHT RAID

Run into the dark depth of London with this skilfull game by S. Abraham.

The object of Night Raid is to guide your car rapidly around the screen blanking out the lights of London town as you go. You are in the midst of an air-raid and no revealing light can remain or disaster will strike. As soon as you have completed this task you must report back immediately by pressing f0.

If your time runs out then a danger sign is printed and the sound of a bomb heralds oblivion.

Use the Z, X, /, and : keys to control your vehicle.

Procedures

PROCTITLE	Sets up title.
PROCINST	Instructions for the game.
PROCGAME	Main part of the program.
PROCEND	Your time has run out.
PROCLONDON	Draws the City of London.
PROCBLANC	Deletes the last char. on screen.
PROCPOINT	Sets the position for explosion.
PROCYOU	Sets bomb to explode on you.
PROCMUSIC	Plays a tune if you complete the screen.

Variables used

A-M strings	Defined characters.
X%, Y%	Car positions.
T%	Time variable.
D%	Amount of time you have.
B%,F%,A%,S%	Sound variables.
V%	Double height variable.
N,L	DATA letters.
Z	Answer for another game.

HOW IT RUNS

Line 20	Main program.
Line 40	Sets colour of screen
Lines 50-60	Define characters.
Line 70	Prints car on screen.
Line 80	Sets time to 0.
LIne 90-200	Loop for movement of car using cursor keys. Checks key f0 and time.
Lines 210-240	Set the co-ordinates of the car.
Lines 260-280	Delete last character.
Lines 290-520	DEFPROCEND sets strings. PRINTs danger warning and explosion.
Lines 540-560	Print title.
Lines 580-640	Print instructions.
Line 650	Delete cursor.
Line 690-780	Choose level of difficulty.
Line 790-840	Draw the city of LONDON.
Line 850	Sets co-ordinates for explosion.
Line 860	Sets bomb to explode on you.
Lines 870-930	Print message if screen is completed.
Line 930	Prints your time.
Lines 940-990	Play tune.
Lines 1000-1030	Ask if you can beat your previous time.

PROGRAM LISTING

```
>LIST
   10 REM NIGHT-RAID by S.Abraham
   20 MODE7:PROCTITLE:PROCINST:MODE2:PROCGAME:PROCEND:END
   30 DEFPROCGAME
   40 GCOL0,RND(7)+128:CLG:PROCLONDON
   50 VDU23,224,24,24,165,231,165,36,36,255,23,225,192,224,240,248,252,254,255,2
55,23,226,255,255,255,255,255,255,255,255,255,23,227,3,7,15,31,63,127,255,255,23,228
,255,255,254,252,248,240,224,192,23,229,255,255,127,63,31,15,7,3
   60 VDU23,230,0,0,0,0,0,0,0,255,255,23,231,255,255,0,0,0,0,0,0,23,232,255,255,12
7,127,63,63,63,31,23,233,31,31,31,15,15,15,7,7,23,234,63,63,63,63,63,63,63,63
   70 A$=CHR$224:X%=600:Y%=50:VDU5:GCOL0,0:MOVEX%,Y%:MOVE600,Y%+30:PRINTA$
   80 TIME=0
   90 REPEAT
  100 T%=D%-TIME:R%=D%-T%:IF INKEY(-33) AND TIME>3750 THEN PROCMUSIC
  110 IF INKEY(-73) THEN GOSUB 210
  120 IF INKEY(-105) THEN GOSUB 220
  130 IF INKEY(-98) THEN GOSUB 230
  140 IF INKEY(-67) THEN GOSUB 240
  150 IF X%>1280 THEN X%=0
  160 IF Y%>1024 THEN Y%=0
  170 IF X%<0 THEN X%=1280
  180 IF Y%<0 THEN Y%=1024
  190 IF TIME>D% THEN PROCEND:END
  200 UNTIL FALSE
  210 Y%=Y%+30:MOVEX%,Y%:VDU224:SOUND1,-15,245,0:MOVEX%,Y%-30:PROCBLANC:RETURN
  220 Y%=Y%-30:MOVEX%,Y%:VDU224:SOUND1,-15,245,0:MOVEX%,Y%+30:PROCBLANC:RETURN
  230 X%=X%-30:MOVEX%,Y%:VDU224:SOUND1,-15,245,0:MOVEX%+30,Y%:PROCBLANC:RETURN
  240 X%=X%+30:MOVEX%,Y%:VDU224:SOUND1,-15,245,0:MOVEX%-30,Y%:PROCBLANC:RETURN
  250 ENDPROC
  260 DEFPROCBLANC
  270 GCOL0,0:VDU226:GCOL0,0
  280 ENDPROC
  290 DEFPROCEND
  300 *FX4,1
  310 VDU23;8202;0;0;0;
  320 B$=CHR$(226):C$=CHR$(225):D$=CHR$(227):F$=CHR$(228):G$=CHR$(229):H$=CHR$(2
30):K$=CHR$(231):M$=CHR$(232):O$=CHR$(233):COLOUR9:VDU4:PRINTTAB(0,0);B$;B$;C$;"
 "';D$;B$;C$;" ";B$;B$;B$
  330 PRINTTAB(0,1);B$;" ";B$;" ";B$;" ";B$;" ";B$;" ";B$
  340 PRINTTAB(0,2);B$;" ";B$;" ";B$;B$;B$;" ";B$;" ";B$
  350 PRINTTAB(0,3);B$;B$;F$;" ";B$;" ";B$;" ";B$;" ";B$
  360 PRINT'TAB(10,7);D$;B$;B$;" ";B$;B$;" ";B$;B$;B$
  370 PRINTTAB(10,8);B$;"   ";B$;H$;" ";B$;H$;B$
  380 PRINTTAB(10,9);B$;" ";B$;" ";B$;K$;" ";B$;K$;M$
  390 PRINTTAB(10,10);B$;B$;B$;" ";B$;B$;" ";B$;" ";O$
  400 ENVELOPE1,1,4,-4,4,10,20,10,127,0,0,-5,126,126
  410 SOUND1,1,100,50
  420 A$=INKEY$(50)
  430 FOR B%=150 TO 75 STEP-1:SOUND1,-15,B%,1
  440 NEXT B%
  450 FOR F%=-15 TO -5 STEP1
  460 SOUND0,F%,5,5
  470 NEXT
  480 FOR A%=1 TO 100
  490 PROCPOINT:SOUND0,-10,4,1:PROCYOU
  500 NEXT A%
  510 *FX4,0
  520 ENDPROC
  530 DEFPROCTITLE
  540 PRINT
  550 FOR V%=1 TO 2
  560 PRINTCHR$(141);CHR$(135);CHR$(157);CHR$(129)"N I G H T - R A I D  ";CHR$(1
56)
  570 NEXT V%
  580 ENDPROC
  590 DEFPROCINST
  600 PRINT'CHR$(134)"It's World War II . The Germans are    ";PRINTCHR$(134)"bo
mbing London at regular intervals at ";PRINTCHR$(134)"night . As security office
r it is your ";PRINTCHR$(134)"job to make sure that all London's      "
  610 PRINT CHR$(134)"lights are switched off so as not to be";PRINTCHR$(134)"se
en as targets for the German pilots  ";PRINTCHR$(134)"Press f0 when you have com
pleted each  ";PRINTCHR$(134)"screen . The controls are :"
  620 PRINT'CHR$(133)"Up    -  :";CHR$(136);CHR$(135)"          Press  'S' "
  630 PRINTCHR$(133)" Down -  /"
  640 PRINTCHR$(133)"  Left -  Z";CHR$(136);CHR$(135)"              to continue"
  650 PRINTCHR$(133)"   Right-  X"
  660 VDU23;8202;0;0;0;
  670 REPEAT UNTIL GET$="S"
  680 CLS:PRINT
  690 PROCTITLE
  700 PRINT'''CHR$(131)"Choose level of difficulty.(1-5)        "
  710 PRINTCHR$(131)"1 is hardest - 5 is easiest";
  720 INPUT D%
  730 IF D%<0 OR D%>5 THEN 700
  740 IF D%=1 THEN D%=3950
  750 IF D%=2 THEN D%=4200
  760 IF D%=3 THEN D%=4400
  770 IF D%=4 THEN D%=4700
  780 IF D%=5 THEN D%=5000
  790 ENDPROC
  800 DEFPROCLONDON
  810 GCOL0,12:MOVE0,600:DRAW1280,600:MOVE0,800:DRAW150,800:DRAW150,600:MOVE1,60
0:DRAW1,800:MOVE25,600:DRAW25,800:MOVE50,600:DRAW50,800:MOVE75,600:DRAW75,800:MO
VE100,600:DRAW100,800:MOVE125,600:DRAW125,800
  820 MOVE200,600:DRAW200,700:DRAW250,750:DRAW300,700:DRAW350,750:DRAW400,700:DR
AW450,750:DRAW500,700:DRAW550,750:DRAW600,700:DRAW650,750:DRAW700,700:DRAW700,60
0
  830 MOVE750,600:DRAW750,900:MOVE725,900:DRAW825,900:DRAW825,925:DRAW725,925:DR
AW725,900:MOVE775,925:DRAW775,975:MOVE800,900:DRAW800,600:MOVE850,600:DRAW900,75
0:DRAW950,600
  840 MOVE1000,600:DRAW1000,800:DRAW1280,800:MOVE1000,625:DRAW1280,625:MOVE1000,
650:DRAW1280,650:MOVE1000,675:DRAW1280,675:MOVE1000,700:DRAW1280,700:MOVE1000,72
5:DRAW1280,725:MOVE1000,750:DRAW1280,750:MOVE1000,775:DRAW1280,775
  850 ENDPROC
  860 DEFPROCPOINT:GCOL0,7:MOVE 640,512:DRAWRND(1200),RND(1024):ENDPROC
  870 DEFPROCYOU:GCOL0,7:MOVE X%,Y%:DRAWRND(1200),RND(1024):ENDPROC
  880 DEFPROCMUSIC
  890 VDU4:COLOUR9:PRINTTAB(0,10)"CONGRATS!!!"
  900 PRINT'"YOU HAVE SAVED THE"
  910 PRINT'"PEOPLE AND CITY"
  920 PRINT'"OF LONDON."
  930 PRINT'"YOUR TIME WAS"
  940 PRINT'R%/100;" SECONDS"
  950 FOR S%=1 TO 56
  960 READ N,L
  970 SOUND1,-15,N,L/2
  980 NEXT S%
  990 DATA 61,20,73,20,89,20,109,10,117,5,121,5,129,5,121,5,117,5,109,5,105,20,1
37,10,109,5,121,5,137,5,121,5,109,10,141,20,129,10,101,5,117,5,129,5,117,5,101,1
0,137,20,121,10,93,5,109,5,121,5,109,5,93,10,129,20,117,10,89,5,105,5,117,5,105
 1000 DATA 5,89,10,121,20,117,5,121,5,117,5,109,5,105,10,121,10,117,5,121,5,117,
5,109,5,89,10,109,10,105,5,109,5,117,5,109,5,109,20
 1010 PRINT'"CAN YOU BEAT IT";
 1020 INPUT Z$
 1030 IF LEFT$(Z$,1)="Y" THEN RUN
 1040 END:ENDPROC
```

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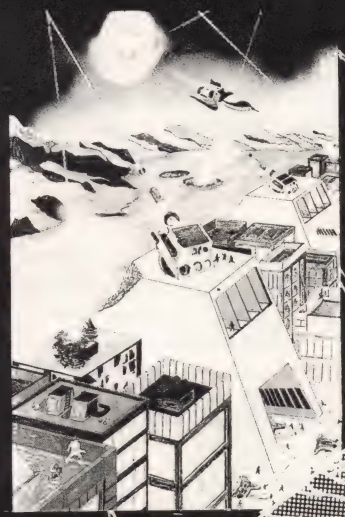

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YOUR LETTERS

This page is where you get the chance to put your opinions in print. Personal Computing Today welcomes letters from you on any aspect of microcomputing and views in general — as long as they're printable!

Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.

Dear PCT
It was with joy that we noticed a CBM 64 'invader style' game in your November issue, and so short! We quickly typed in in and then spent ages de-bugging it!!

So for those readers who weren't as persistent as us, here are our corrections:
Line 30 — leave out the final 247 and begin line 31 with it, i.e. DATA 247,64,65. . . , ending this line with 253. The final number (85) from line 31 must be brought down to begin Line 32.
An extra line is needed thus: Line 16 PRINT"(CLR HOME)" which is achieved by holding down the SHIFT key and CLR HOME.
Line 51 should read
POKE54273,34:POKE54272,75PRINT"(CLR HOME)"

Now the game should be playable. However, we're not sure it's worth it, what with invisible bullets, aliens which don't explode so you don't know when you've shot one, but which jump from halfway across the screen to the edge (athletic attackers?), and a gun which looks like a wigwam (which is perhaps why it can't shoot bullets!). We would have scored over a million but fell asleep before our invisible bullets managed to notch up 200 points, (or to be more exact 199.736).

Come on, we know you can do better than this. Decent software please.
Yours hopefully,
Edwin and Simon Sheaf
Hove

Editor's reply: Not too sure whether to thank you or not for this letter boys. I'm sorry the game wasn't up to your standards, but look forward to plenty of good games for the CBM 64 in the coming months and we'll try our best.

Dear PCT
I am writing to you in the hope that you have the courage to print this letter, being a Texas supporting magazine. I wish to expand my Texas to 32K but having spoken to Texas Instruments find that under no circumstances is the computer able to store more than 13K programs on cassette. To store a program greater than this it is necessary to buy a disc system. This is where the bug bites. The disc system costs approximately £500 including the discs, 32K memory card, disc controller and peripheral box.

This fact is not mentioned anywhere in Texas's advertising literature. They say the system is fully expandable to 32K, and this is true, but it's a high price to pay considering the basic machine is under £100. I hope you print this so that other people are duly warned. I hope that T.I. bring their prices down in the light of this or how can they hope to sell their products.
Yours faithfully,
MC England
Northwich

Editor's reply: Thank's for pointing out this problem. I'm sure many readers will find it interesting — maybe even T.I. themselves will take note.

Dear PCT
I write in response to the letter from Leonardo Esposito in the November issue of PCT. It appears he has trouble receiving a copy of PCT in time to enter your competitions because he lives in Australia. I am surprised you didn't suggest taking out an airmail subscription. I received the November issue on 12th October, which must compare favourably with the date it first appears on shelves in the U.K. Another bonus of an airmail subscription is that in comparison with other magazines on sale here with a similar U.K. price tag, it actually works out cheaper.

It is also worth noting that software etc can be obtained from U.K. advertisers. Anirog provide an excellent service with a receipt period of 10-12 days from postage. What we ex-pats need are more reviews of software and add-ons for the various computers. Manufacturers tend not to give a full description of their goods which results in readers having to find someone who 'knows a bit more about it' before buying.
Yours faithfully,
Bill Pemberton
Papua New Guinea

Editor's reply: Thanks for writing to us all the way from Papua New Guinea, Bill. The information you have given us about the airmail subscription should be useful to Mr Esposito and other overseas readers (see inside front cover). I'm sorry that you feel PCT falls short in supplying reviews of software and hardware but we have to fit these sections in amongst all the programs which readers want. As I've said before, all we can do is to provide a balanced magazine. You should have enjoyed reading the extended software review sections in the November and December issues anyway.

Dear PCT
I write to you following a remark made to me by a very experienced computer programmer. He said he thought it was a great pity that most people bought a micro simply to play games even when the cheapest micros are capable of carrying out quite complicated tasks. Having read most of the micro magazines over the last few months and spoken to several people, including businessmen contemplating buying a system, I am inclined to agree with him. Computers are a part of everyday life; whether you are buying petrol or groceries, paying bills or drawing money from a bank dispenser, one is in contact with a computer. A micro can be a very useful part of

everyone's life and as yours is the most readable magazine I have found, I write to you suggesting a scheme which may help bring the recognition the microcomputer deserves.

My idea is for your magazine to run an award scheme on a regular basis for the person who submits to you the idea most likely to help this cause. It could be a new game format, a home economics program, a plan for turning your home system from a jumble of wires that the wife is always complaining about into an attractive and functional piece of furniture, educational programs for the very young — in fact anything relevant to the cause.

I hope you will consider this and I would be interested in hearing your views on the matter.

Yours faithfully,
Paul W Saunders
Bury St Edmonds

Editor's reply: Thank you for writing in with this suggestion. Your point about microcomputers being much more than games machines is very true and supported by very many of our readers I am sure. This is borne out by the fact that we receive so many utility programs as well as games from readers. It is also noteworthy that the younger readers are turning to more stimulating and useful programs than the 'shoot them down' arcade type games. Your suggestion of having an award scheme is one which is well-worth considering. However, I believe that there is sufficient incentive for writing such programs/articles already and PCT is always ready to consider any material for publications. So, any of you with ideas, get them down on paper and send them in!

Dear PCT

My 16 year old son was excited to read in various publications, including your November magazine, that the Electron was available. He forthwith sold his Spectrum machine expecting to be able to buy the Electron in Truro or Plymouth. However, after many 'phone calls around dealers in the South West, we were told that November would be the earliest any of the dealers would have a stock of these microcomputers.

I am very indignant that after such extensive advertising, Acorn are not producing the goods. Surely there is no need to advertise so freely weeks before the machines are available.

Mrs M R Ferrett
Boscastle, Cornwall

Editor's reply: I'm afraid Acorn Computers, who manufacture the Electron, are only following common marketing procedure in advertising their product so comprehensively. However, once again, it appears that this marketing policy have been too successful and demand is exceeding supply, as happened with their BBC microcomputer.

I contacted Acorn Computers in October and at that time, I was reassured that the Electron was being produced on schedule and that distribution to W.H. Smith was occurring at the projected rate! The major stores were receiving large stocks and the branches were being supplied by them. Stocks were expected to be sufficient by December to meet the Christmas demand. The Acorn shop is Charlotte Street, London (opening date end of October) should by now be able to cope with the expected demand. I hope your son has been fortunate enough to have found and purchased a machine.

Dear PCT

RE: Your Oric v Spectrum article in the October issue

I read the above mentioned article because I own an Oric, bought after long deliberation between that and the Spectrum. I did a little comparing myself before buying the Oric and I came to somewhat different conclusions to Mr Nowotnik.

I won't go as far as accusing him of being subjective but I find it strange that he only mentioned features of the Spectrum which are absent from the Oric. The Oric has "IF, THEN, ELSE", "REPEAT UNTIL", "DOKE (double POKE)", "DEEK (double PEEK)", "WAIT", statements which I found lacking in the Spectrum.

I agree with him about the problems of software, but there is some fairly good stuff now flooding onto the market for the Oric and it is improving in quantity and quality all the time.

Furthermore, I disagree with Mr Nowotnik about value for money between the two machines. He bases his figures solely on the price but the Oric price included a Centronics interface, while the Spectrum price is for the machine alone.

Although I uphold the right of free speech and personal opinions, I think Mr Nowotnik should have been a little more objective, since as he says in the article, he is writing to help us decide which of the two comes out on top.

Yours faithfully,
P. Kolenbrander
Eindhoven
The Netherlands

Editor's reply: Many thanks for your comments. It is always difficult to put across a totally unbiased view but we felt, like many other readers, that Mr Nowotnik did a commendable job. But, as you say, we're all entitled to our opinions and we love to hear them.

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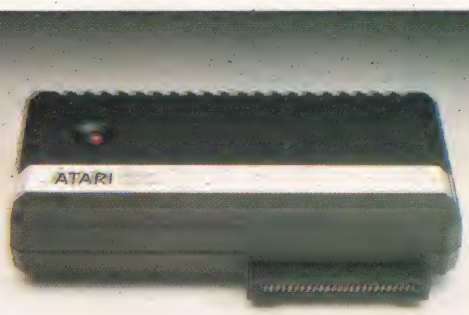

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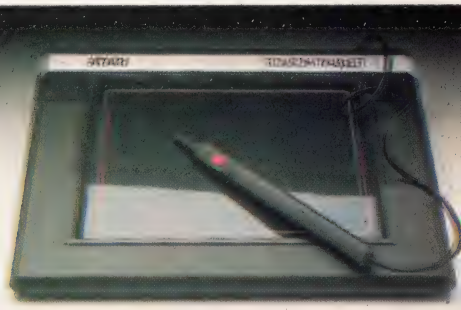

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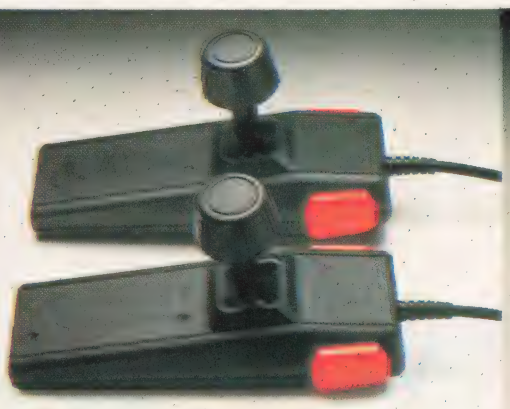

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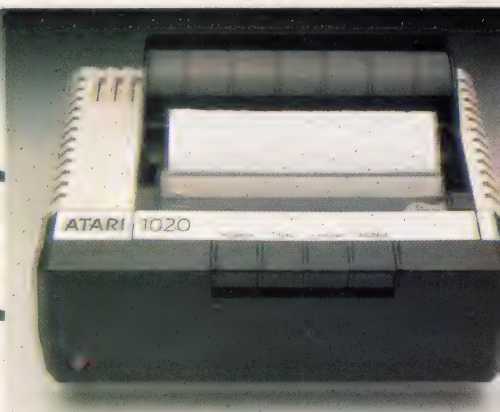

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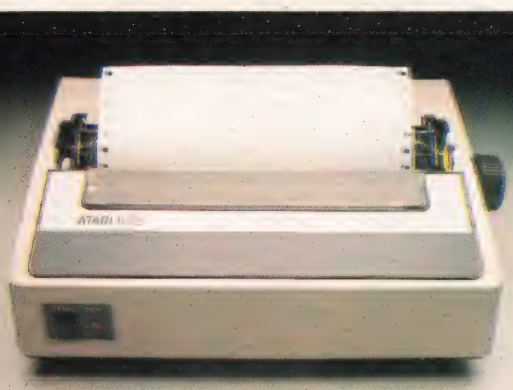

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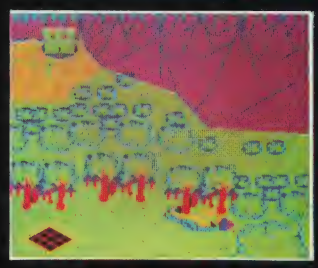

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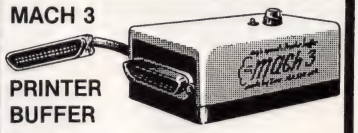

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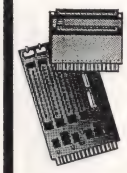

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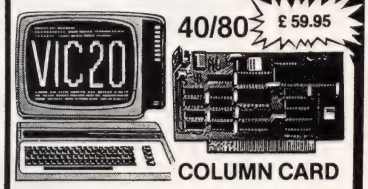

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HARDWARE REVIEW

LASER 200 REVIEW

David Nowotnik dodges the beams to get to the core of the matter.

The main claim to fame of the Laser 200 is that at £70, it is Britain's lowest priced colour computer. It verifies that old rule of thumb that you only get what you pay for. The low price is achieved by providing the user with the most basic of computer systems.

The Laser 200 is a good-looking computer. It comes in a white plastic case with a comfortably angled forward sloping keyboard. The 56 rubberised keys of the QWERTY keyboard are orange in colour, and have a feel identical to the keys of the Spectrum. The keys are small and spaced closer together than on professional keyboards, making typing difficult.

At the rear of the computer are two ports; one is for memory expansion, the other for either a joystick adaptor or the Centronics printer interface adaptor. These are the only promised add-ons for this computer. There is a choice of output to TV or monitor, although there is no clear indication which type of monitor can be used.

Supplied Extras

The computer is supplied with an external power supply, TV and cassette leads, a demonstration tape, and three manuals. The 150 page 'BASIC Reference Manual' provides a reasonably good introduction to BASIC. A six page user manual explains how to set up the computer, and a 24 page booklet gives some simple programs to type in. The whole package is aimed at the beginner; there is little to help the more experienced programmer to find out more about the system.

BASIC Language

The Laser 200 uses standard Microsoft BASIC in a 16K ROM.

Commands and functions can be entered either by typing the word in full, or as a keyword. With less than 35 commands available to the user, the Laser 200 is not a powerful computer, but should be easier to master than most other micros. There are no obvious bugs in the BASIC translator. The operating speed is quite fast; in tests I found it ran faster than both the Oric and Spectrum machines, and about the same as the vastly more expensive Commodore 64.

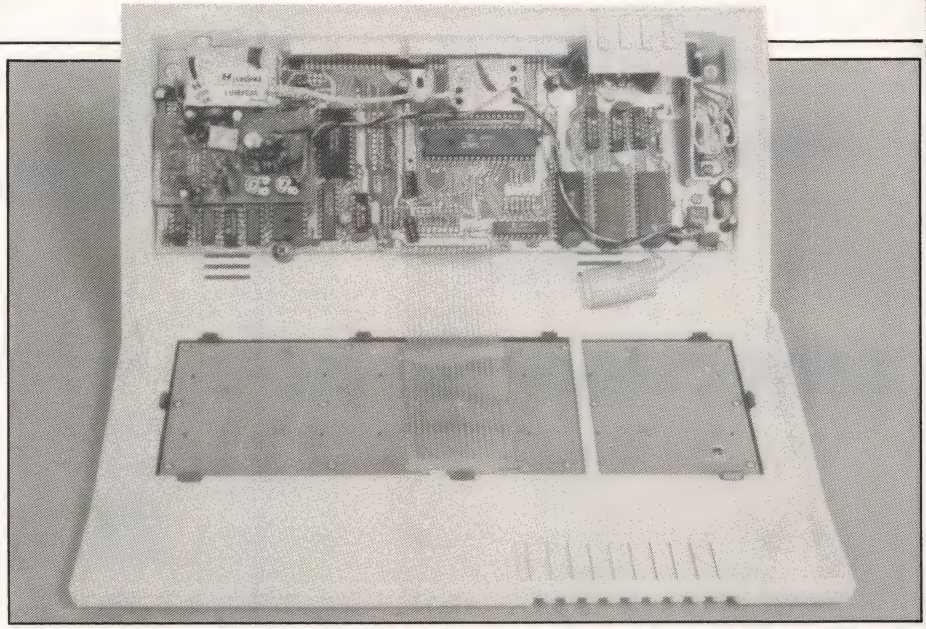
There are two display modes; mode 0 offers text and low resolution graphics. Mode 1 is generously called high resolution in the handbook, but it has rather poor 128 × 64 pixel resolution. In mode 0 you get a screen display of 32 × 16 characters. The Laser 200 has upper case characters only, no '£' symbol, and a small range of quarter square graphic characters to give 64 × 32 chunky graphics which you can mix with text in mode 0. In each mode your choice is restricted to two background colours. Text can only be white in colour, although INVERSE will swap background and foreground colours if desired. All eight colours on the screen at once can only be achieved with the chunky graphics of mode 0. In high resolution mode, you can only have four foreground colours, and one of these is the same as the background colour. I tried the Laser 200 on several colour TV sets and the colour quality was never particularly good.

Hi-Res Restrictions

High resolution drawing is difficult. There are just two high resolution commands; SET and RESET switch on and off selected pixels. The function POINT is used to determine which state a pixel is in. There are no commands to draw lines and circles which are standard on most of the other micros offering high resolution.

The Laser 200 produces limited sound effects through an internal speaker using just one command, SOUND. With this command, only the pitch (the range is 2.5 octaves) and duration of a note can be set. As with the Spectrum, there is no separate sound chip, so there is a pause in the program operation when sound is used.

Programs may be saved on a standard domestic cassette player. For cassette handling, commands CLOAD, CSAVE, and VERIFY are available. CRUN allows programs to auto-run on loading. The demonstration tape proved to be troublesome to load but I experienced no problems when loading and saving my own programs. There are two commands to save and load data, PRINT and INPUT , but these are very restrictive and not really suitable for database applications.



Above: This view of the main printed circuit board shows how little internal structure is necessary in a modern microcomputer.

Worthy of a mention are the useful formatting commands in mode 0 (text mode). PRINT@ and PRINT USING can be combined to give easier screen layout of data than the more powerful £100 micros.

Miniscule Memory

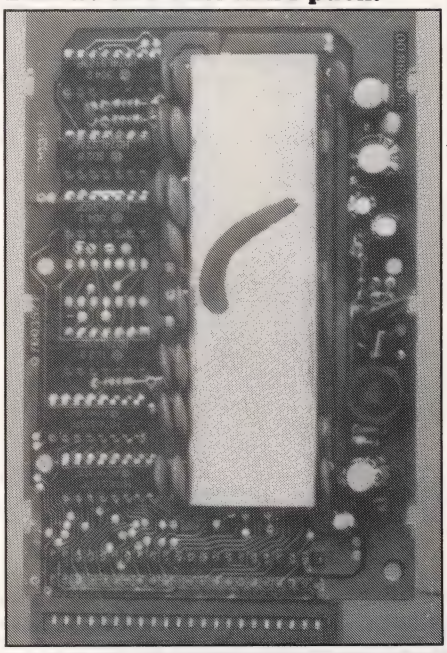
The Laser 200 is supplied with a minute 4K of RAM. The system grabs a big share of this, and only 1.25K is available for user programs and data. Therefore, if you wish to write or use programs of any substance, the 16K RAM pack for the Laser 200 is a must. This will give you 20K total RAM, 17.25K user RAM, but adds £29.95 to the cost of the computer. Much of the software available for the Laser 200 will need this extra RAM for operation. If even more memory is required, a 64K RAM pack should soon be available.

How It Compares

If you are an absolute beginner to micros and want a modest but reliable computer to try then the Laser 200 might be worth a consideration. However, the more powerful Oric, Spectrum and Aquarius computers cost, at the time of writing, about the same as the Laser 200 plus its 16K RAM pack, and offer better expansion capabilities. So if you are tempted by the low price of the Laser 200 you must be prepared to trade it in if your interest in micros develops to outstrip the limited capabilities of this computer. I doubt if the Laser 200 will be of much interest to the more experienced micro user. It should not be forgotten that the Laser 200 first appeared on the UK market as the Texet, early in 1983. That computer was caught out by falling prices. The Laser 200 might suffer from the same fate.

The Laser 200 is distributed by **Computers For All, Southfields Industrial Park, 30 Hornsby Square, Laindon, Essex: Tel 0268 418414.**

Below: The 16K RAM pack.



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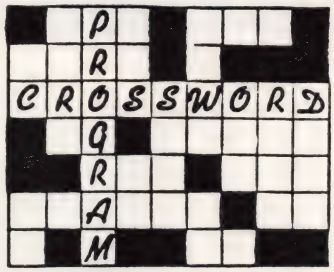

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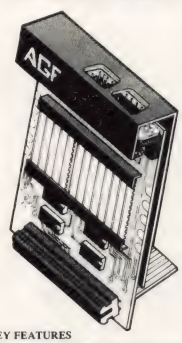

KEY FEATURES

- Programmable design gives TOTAL software support.
- Accepts Atari, Competition Pro, Wico, Starfighter, Quick Shot, Le Stick etc.
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- Free demo program and instructions.

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When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key 0. This unique feature guarantees the best software support.

Take a look at the selection of compatible games we have listed. More are being added all the time as a result of our contact with the various software companies.

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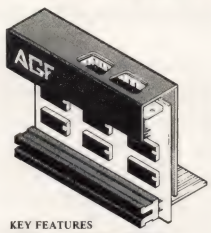

KEY FEATURES

- Proven cursor key simulation for maximum software support
- Accepts Atari, Competition Pro, Wico, Starfighter, Le Stick, etc Joysticks
- Second Joystick facility
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	SOFTWARE:		
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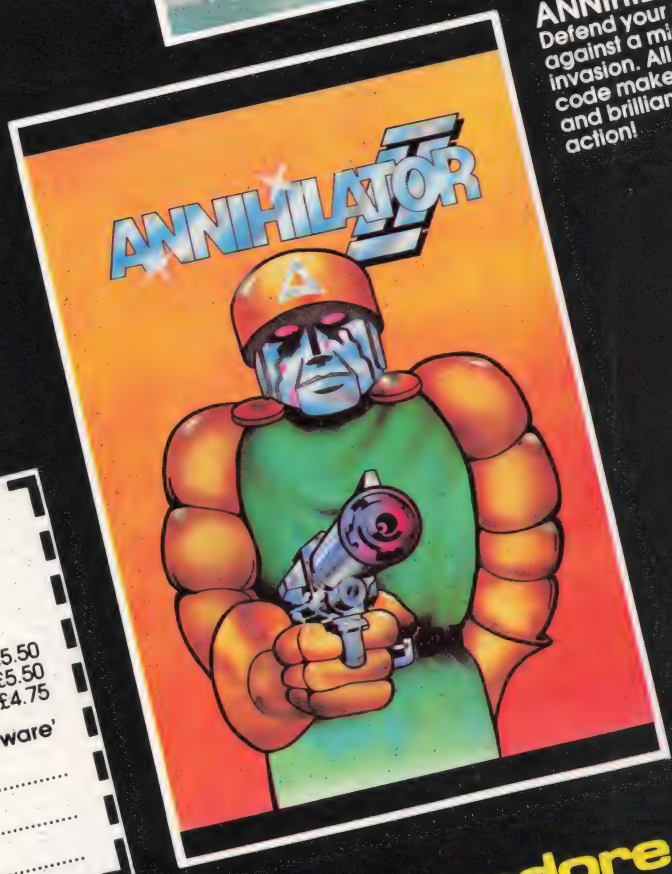

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If you wish a personal reply, please enclose a stamped addressed envelope *and the reply coupon from this page*. This is to enable us to give priority to regular readers of PCT.

Dear PCT
I have recently purchased a VIC 20 computer with which I am very pleased. However, it lacks a BEEP command facility and I wondered if there was a program which I can use with the VIC 20 to give me this facility.
Yours faithfully,
J C Mallinson
York

The VIC has very good sound and the scope given by the machine is far greater than that by the Spectrum's BEEP command. However, it is far more difficult to use sound on the VIC. If you read the chapter on programming sound in the VIC 20 User Manual or in the Programmer's Reference Guide and follow the examples you will find out how to obtain a 'beep' by POKING.

Dear PCT
I am a complete beginner to computers, having acquired a Spectrum very recently. I found the October edition of PCT very interesting indeed, but should be grateful if you could give me explicit instructions for using the free 'Shape Maker'. I am also having problems in transferring software, bought commercially onto blank cassettes for back up. In the past I have encountered no problems with audio tapes. What is the reason here?

I shall be most grateful for all the help and assistance you are able to give me.
Yours faithfully,
S. Smith
London

Taking your last point first I can't understand why you are having problems but you must bear in mind that audio copies are made at a lower volume than computer programs. If the signal going in is as strong as that coming out (usually well into the red at + 3 or + 5 decibels), then you should be able to get a copy. Remember that, except for backup copies for personal use, it is illegal to make copies under the copyright protection Acts.

Use of the shape maker requires a knowledge of user-defined graphics. The best book for you to look at is probably your own Spectrum handbook or 'Better Programming for your Spectrum and ZX81 by S.R. Speed. Basically the computer gets its characters from ROM, each one being a grid of 8 × 8 dots. One can tell the computer to get its information from ROM and by setting up these 64 points define your own shape. The shape maker helps you to convert from the binary bit pattern of the shape to the number needed to POKE into the computer's memory. You will need eight numbers (one for each row) for each character.

Dear PCT
Would it be possible for you to tell me whether or not the teletext adaptor of the BBC Micro is necessary to receive teletext, or whether one can use a T.V. set already having the teletext facility?

Could you also tell me if there is a chess program which uses a light pen available for the BBC Model B.
Yours faithfully,
Adam Tanner
Cheadle Hulme

To use the teletext system on the BBC micro you must have the teletext adaptor, OS 1.0 or OS 1.2, the TFS ROM and a strong television signal. The signl goes into the teletext adaptor where it is decoded and the information required by the computer is sent down the 1 MHz bus. The teletext adaptor also understands commands from the computer such as "change channel". It would not be possible to adapt a teletext T.V. receiver to do this and would possibly be dangerous to try. The BBC adaptor is specially built for use with the computer. If you were to use a teletext T.V. with your BBC the teletext information and decoder are of no use to the computer.

I do not know of a chess program for use with a light pen. Issue 2 of Model B Computing, which is a tape based magazine, will have an excellent Towers of Hanoi for use with a light pen.

Dear PCT
May I benefit from your experience of micros and as it were think aloud, and seek your comments on my thinking.

I am interested in purchasing a micro with the following uses in mind — keeping records of a congregation of some 400 people, learning programming, and some games facility. Also in the future I would like to add a printer and a limited facility wordprocessor (for my work a 40 character line would not be too much of a problem). I have scanned many articles and magazines and have formed the opinion that the Commodore 64 would be a reasonable purchase, especially as the price has dropped recently. It seems to have an adequate memory and a solid keyboard. Looking to the future its printers and discs seem to be available at reasonable cost. For the moment I would be using a black and white portable T.V. for display. Would you agree with this thinking, or would you suggest an alternative? Are the Commodores reliable?

Also I know the IBM 64 requires its own cassette deck. I run a large Ferrograph reel-to-reel deck with full remote control facilities, and would like on occasions to use this for information storage, is that possible using an appropriate interface?
Yours sincerely,
Rev. Derek Corner
Greenock

Editor's Reply: Although, we do not usually enter into correspondence about decisions to buy a specific machine in this case it would seem to me that you have already made up your mind up on the matter of getting a Commodore 64. I would agree with you that it is a microprocessor capable of dealing with the work you have in mind for it. However, in the long run I think you will find the need to buy a colour T.V. receiver or monitor to make use of the excellent colour graphics of the machine.

With regards the tape facilities. You are right in thinking that the Commodore 64 requires its own Commodore cassette recorder and in the long run, such dedicated recorders are by far the best system. However, should you still wish to use your reel to reel you will need to interface it with the micro. We don't know of any interface that are made commercially for this purpose, but you may be able to have one specially made by a company who make them to interface with the Commodore 64 and with other cassette recorders for owners who wish to upgrade their recording facilities.

Dear PCT
I have recorded a program that draws different coloured designs on the screen with a joystick for use with a VIC 20. Is there a method of saving these designs on tape?

Yes, there is a way of saving these designs. You will need to write a program which reads the screen memory and writes a data file. One possible one is:

```
DIM SM (number of points on the screen)
FOR C=  SCREEN START  TO  SCREEN END
SM (C-  SCREEN START  )=PEEK (C)
NEXT
OPEN 1,1,1, "SCREEN"
FOR D=0 TO (number of points on the screen)
PRINT  1, SM (D)
NEXT
CLOSE  1
```

which will save the screen. You will then need a similar program to read the saved data back.

Dear PCT
I recently purchased the October edition of your publication, Personal Computing Today, with the PCT Shape Maker on the front cover.

I can now design my own characters, but I don't know exactly how to initialise the keys with the new character. I know that for the VIC 20, the POKE 56,28 and the POKE 52,28 commands must be used, but that is all I know.
Yours sincerely,
R.F. Zeeuw
Holland

On Power Up, the VIC takes its character set from ROM. To use user definable characters you must tell the VIC chip to look at RAM and then it is best to copy the character set from ROM into this area of RAM. You can then change the characters by poking into this area. I would recommend the VIC Programmers' Reference Guide for a more detailed explanation of how to do this.

—Corrections—

PINK PANTHER needs an extra line adding to the listing: Line 5 eS = ""

OXO: Line 20070 of this listing was incomplete. It should read:
IF S = 241 THEN FOR S = 241 TO 130 STEP – 2.
Clearer listings of this program by Stephen Meredith can be obtained by writing to the editorial department at the address given inside the front cover.

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January 1984

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GAMES

SOFTWARE REVIEWS

Each month PCT will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers, each of whom is a seasoned user of his/her particular machine — and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything else!

Our 'Ratings Table' headings are:

Program Quality

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why *should* simple games cost up to £12 per tape? We judge this one on an overall basis — how much work have the suppliers put into the program and is the price reasonable?

Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package — vital for games!

Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them *all* used!

Supplied Instructions

Regardless of whether the instructions come on sheets of paper, or are presented as text on-screen, they should be as clear and as concise as possible.

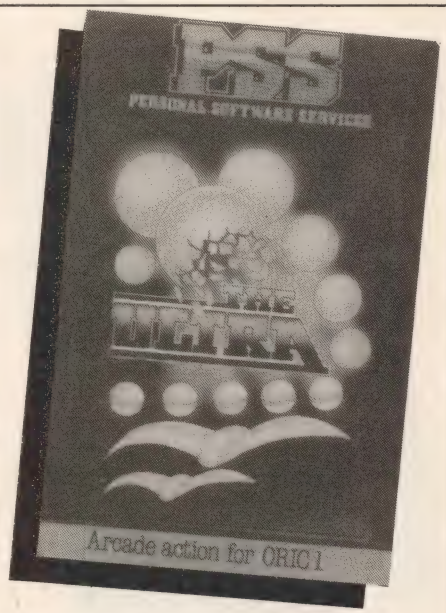
Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

Delve into or Software collection and choose your next entertainment

Title:	**The Ultra**
Type:	**Tape**
Supplier:	**P.S.S.**
Machine:	**Oric-1 48K**
Price:	**£6.95**

If you want a fast 'n furious, colourful arcade game, then buy the Ultra — it's fantastic. There are 16 waves of grotty aliens which are apparently forms of 'an evil race of mutants' to quote the cassette insert and which you have to zap with your laser base.

Playing without the handy pause button proved difficult — I could only scratch through eight waves without it! The bonus points are gained when the 16 waves have been cleared — a congratulatory remark is displayed and then you start again at the first wave but with the aliens moving even faster and in different colours.



Movement is smooth but sound isn't used very imaginatively. Other featues worth a mention are: Hall of Fame, three sound levels, pause key, heat level indicator — important as you will soon learn!!

It is hard to fault this game, but joystick control or keyboard control re-figuration would be nice, and sound could be improved. Overall though the game is excellent and very addictive.

D.T.W.

Ratings Table

Program Quality	* * * *
Value for Money	* * * * *
Presentation On-screen	* * * * *
Ease of Use	* * * *
Crashproofing	* * * * *
Supplied Instructions	* * * * *
Overall	95%

SOFTWARE REVIEWS

Title:	**Spacefighter Pilot Missile Man**
Type:	**Tape**
Supplier:	**Jupiter Cantab**
Machine:	**Ace 3K**
Price:	**£5.95**

These two programs on one cassette are fine examples of what can be done using a mixture of FORTH and machine code in less than 3K of RAM. Spacefighter Pilot provides an excellent simulation of taking off from a runway into a changing pattern of nocturnal stars and the illusion of motion is produced and sustained by moving lines. There are two "warp speeds", fast and very fast, and a running score of missiles zapped and missiles which got through is maintained in large figures at the bottom of the screen, against the usual whooping background of what the arcade addict has come to think of as space noises.

There is an instruction "SH — Silent" on screen, but no way could I find of activating it. You can change the warp speed and zero and counters in mid-game, but the only way to escape is to cut off the power. This disabling of controls is presumably a protection against copying, but it unfortunately also prevents the user studying the skillful programming. The instructions are terse to the point of inadequency, but most users will sort them out by trial and error, although they should not have to.

Missile Man is a clever if relatively basic interpretation of an old arcade friend without the protective forts at the bottom of the screen down which the "hoards" (sic) of space invaders slide diagonally while the bombs fall vertically, which adds an element of new interest. The playing area only occupies about half the screen and the score is kept to the right of this. Movement is on the slow side and somewhat jerky, but not unacceptably so, for this is FORTH without benefit of machine code. The player's single gun moves and fires in the usual way.

The program is protected and use of the "V" key to start the game prevents the user examining the dictionary with VLIST. There should be some recognition of the fact that many users want more than just the run-time effects of the program they buy. **G.M.**

Ratings Table

Program Quality	* * * * *
Value for Money	* * * * *
Presentation On-screen	* * * * *
Ease of Use	* * * *
Crashproofing	* * * * *
Supplied Instructions	* *
Overall	90%

Title:	**British Lowland**
Type:	**Tape**
Supplier:	**Cases Computer Simulations**
Machine:	**48K Spectrum**
Price:	**£6.00**

British Lowland is an all text simulation of a small sports car company. My initial impression of such simulations is one of doubt. The structure of these games is such that even a novice user will soon be writing his own, and I think this is borne out by the number of these programs being published in magazines. Because of their structure the games they are more suited to BASIC than to machine code. BASIC allows very complex structures and can produce very good renderings of simulatory games.

Well, to the game. You start with being asked your skill level. Four levels provide a fairly balanced challenge. A few nice tunes complement the text, including a little rendering of 'We'll keep the red flag flying here' whenever the unions are active (accompanied by a red screen!).

Every month you are provided with an account and a bank balance. You may choose between four options of action including manipulation of prices and numbers of production lines. Occasionally you are given the chance to launch new models or upgrade your existing ones. Adversities such as strikes and accidents keep you on your economic toes. Union requests include shorter weeks and larger wages, which, if ignored, are usually followed by strikes.

I showed the game to a few of my friends who are A-level economic students and the response was enthusiastic. All in all, a fairly good game if you like this sort of thing. A mite overpriced though. **P.C.**

Ratings Table

Program Quality	* * *
Value for Money	* *
Presentation On-screen	* * *
Ease of Use	* * *
Crashproofing	* *
Supplied Instructions	* * *
Overall	55%

Title:	**The Frogger**
Type:	**Tape**
Supplier:	**Microdeal**
Machine:	**Dragon 32**
Price:	**£8.00**

Once upon a time there was a frog who appeared to have an irresistable urge to commit suicide — or that is what playing The Frogger will have you believe.

The purpose of the game as we all know is to manoeuvre this frog and his family across a busy main highway — a sort of quadruple contraflow for those more used to negotiating Britain's motorways. Traffic of various sizes and speeds travelling in each direction. Having successfully negotiated this obstacle the poor old frog has to try and cross a river by jumping on the backs of turtles who have a habit of diving at the wrong time, logs which travel at varying speeds and avoiding the wicked serpent who's looking for a meal. Success is achieved when he get into his home on the river bank providing no-one has put a gate across it.

At first you have four frogs to get across, once you have filled up the five spaces on the far side the action speeds up, more vehicles on the road and less 'stepping points' on the river. The action continues

until all your frogs have either been run over or drowned — although I always thought frogs could swim!

The entire game is accompanied by increasingly frenetic music and scores are displayed at the top of the screen, but it's a pity that the facility to save a score isn't there. The player(s) has the option of Joystick or Keyboard.

The program is presently the top selling game in the US and with this version's good graphics and smooth action I think it could very well find itself in the same position here. **D.W.**

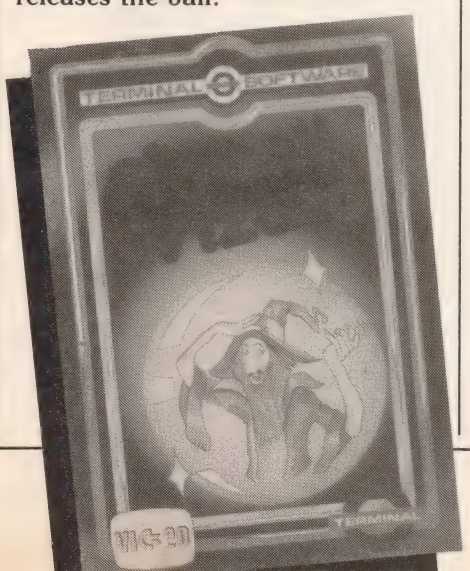
Ratings Table

Program Quality	* * * *
Value for Money	* * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * * *
Overall	85%

Title:	**Pinball Wizard**
Type:	**Tape**
Supplier:	**Terminal Software**
Machine:	**VIC 20 (unexpanded)**
Price:	**£7.95**

Having seen quite a lot of VIC software, I was rather sceptical of the claims on the packaging. However, once the game is loaded seeing is believing.

Your display shows a pin table, complete with bumpers, rollovers, flippers and score display. The game can be played by one or two players which adds to the competitive spirit. Function key F1 selects one player; F3 two players. Function key F5 pulls the plunder back to varying degrees, and F7 releases the ball.



Now the fun begins. The ball moves with flicker-free precision around the table, bouncing off side walls and bumpers with accuracy close to the laws of reflection. The only key to press now is the Commodore logo key, which activates the flippers. These act as on a real table and must be hit at the precise time to effect the desired result.

I almost forgot to mention one very important key, the space bar. As every good pinball player knows, a quick shove of the table can gain a new high score, just so in this game.

A press of the space bar give the ball that extra bounce off the side wall to stop it going down the gap between the flippers.
WARNING: Do not press the space bar too often or a TILT results and one ball's lost.

If you are tired of the run of the mill, "BLAST the alien" type game, then this game is for you. The excellent use of sound, HI-RES graphics and colour make this game worthy of any software collection.

R.W.

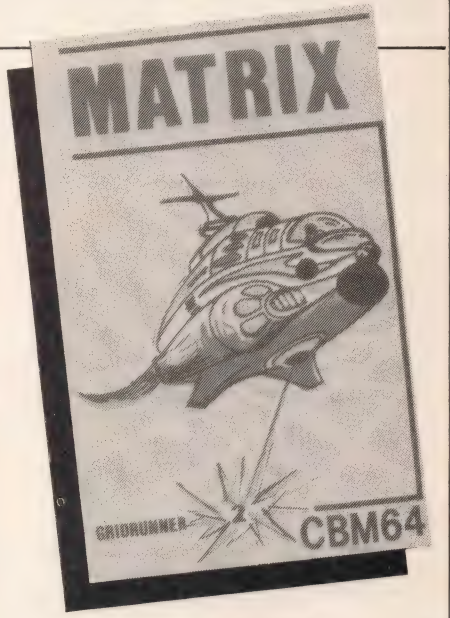
Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * * *
Supplied Instructions	* * * *
Overall	90%

Title:	**Matrix**
Type:	**Tape**
Supplier:	**Llamasoft**
Machine:	**Commodore 64**
Price:	**£7.50**

Matrix is an excellent follow-on from Gridrunner by the same company. In this game the fighter has greater manoeuvreability and firepower due to a very well-written machine code program but this is counteracted by very vicious droids who will do anything to kill you.

The game is quite straight forward until level four (of 20) when 'cameloids' will descend onto you. To actually score some points is very hard. There are various things to use and beware, the deflectors and the zappers are but two of these. The dreaded 'snitch is really bad, being a humanoid who decided the pay was better on the other side!!



The game can be broken out of by resetting the machine. The graphics alone warrant the price of the cassette and the sound is the best my 64 has produced. There are more than enough instructions supplied and a brief history of the game is included.

Definitely one of the best games I have ever played on the CBM64!

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * *
Overall	90%

Title:	**One Hundred and Eighty**
Type:	**Tape**
Supplier:	**A & F Software**
Machine:	**BBC A & B**
Price:	**£8.00**

This game of darts is for two players and loads in two parts. The first is an instruction section using coloured Mode 7 text, which I found incredibly clear and accurate. It describes the four variations featured on the tape; Shanghai, Noughts and Crosses, Round the Clock and of course, the normal game of darts.

When the game has loaded automatically, it starts by giving the players a set of choices. First it asks for the names of two players. Then it asks which of the four variations of play is required. Once the variation has been chosen, more questions determine the skill

SOFTWARE REVIEWS

level desired and the length of the game. Once all these questions have been answered, the screen design is drawn which takes some time, since the program is written in BASIC.

A perfect darts board is drawn in the centre of the screen. A window shows the flight path of the dart (which one controls using the UP and DOWN keys) and two more windows on either side show the players' names and a picture of a man sitting in a chair who stands up when it is his turn.

To position the darts, one uses a system of crosses parallel to each other; one above and one below the board. I found these very unsettled on the first level so one can imagine how bad they were by the fifth, causing immense problems with regards accuracy.

My only other criticism of this game is the sound quality. There is a pathetic "thud" when the dart hits the board and when a player wins the game, there is a whining which sounds like a cat being strangled!! Apart from the keys used to control and launch a dart, the ESCAPE key resets the game and the BREAK key has its normal function.

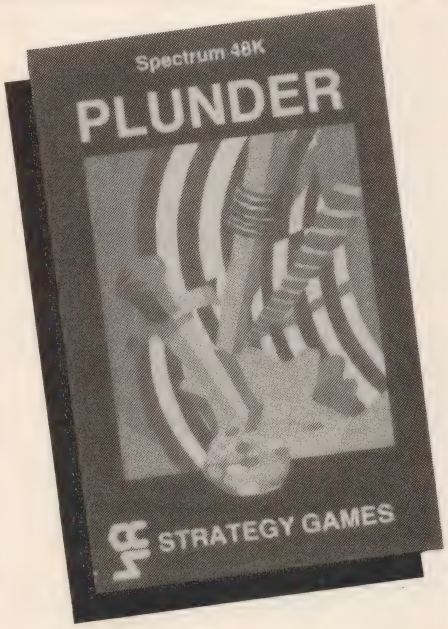
Overall, I found this game fun to play and think it will entertain people of all ages. **G.J.B.**

Ratings Table

Program Quality	* * * *
Value for Money	*
Presentation On-screen	* * *
Ease of Use	* * *
Crashproofing	* * *
Supplied Instructions	* * * *
Overall	70%

Title:	**Plunder**
Type:	**Tape**
Supplier:	**Cases Computer Simulations**
Machine:	**Spectrum / 48K**
Price:	**£6.00**

This latest release from Cases Computer Simulations puts you as Captain of a ship in the year 1587. The idea of the game is to prevent the Spanish ships from transporting gold across the Atlantic from America to Spain. Failure to do so will enable the Spanish to build their Armarda and sail against England leaving your dreaded rival, Sir Francis Drake to save the day.



There are nine levels of play with each level requiring more gold to be stopped before completion. Full instructions are given on the insert and are repeated upon loading if required. A high resolution map of the Atlantic is then displayed showing your ship flashing on a grid. Movement is achieved by the cursor keys for north, south, east, and west, with the first four number keys giving diagonal movement. Occassionally after a move, or turn, your lookout will report a ship of some nature. You are then asked whether to attack or not and if you do, whether to fire or board.

After a few encounters your crew, weapons, and damage points will become depleted and need restocking which is achieved at one of the ports marked in red. A minor criticism here is the jerky movement of the screen during docking which is rather confusing. However, after docking has been accomplished a menu is shown, which contains the prices of men and cannons etc, as well as the market option. The market also shows various goods and their prices eg, jewels, grain, opium, etc, these can be brought at one port and sold at another, sometimes for a profit. Of course you will need gold for all of these goods, so try not to sink too many ships. So the game continues with a series of battles, retreats, and repairs until you run out of turns, are sunk, or manage to stop enough gold.

All in all a pretty good game, but I cannot imagine wanting to play it too often. **G.W.**

Ratings Table

Program Quality	* * * *
Value for Money	* * * *
Presentation On-screen	* * * *
Ease of Use	* * * *
Crashproofing	* * * * *
Supplied Instructions	* * * * *
Overall	75%

Title:	**Cosmic Zap**
Type:	**Tape**
Supplier:	**Microdeal**
Machine:	**Dragon 32**
Price:	**£8.00**

Cosmic Zap is a space invader type game for the Dragon 32. You have to kill aliens and protect yourself from their attack. All you have to protect your base is a laser cannon, which has the annoying tendency of overheating.

The aliens attack from only four positions on the edge of the screen. They then start firing bullets, so you have to blast the bullets and then hopefully blow up the attacking ship. This continues until you have killed the numbers of aliens required on that level (about 15 on level 0, and about 30 on level 15). Constant fire is not allowed as it heats up your laser cannon and if the cannon reaches a certain temperature it melts down and you lose one of your three shields. Also if a bullet hits you you lose a shield.

After you have killed the required number of aliens you meet the Death Satellites, which have to be shot as soon as possible as they soon leave their orbit and come in to collide with you. After the Death Satellites (normal aliens) return. Every 10,000 points you score you get an extra shield and you increase two levels.

The display constantly informs you of gun temperature, shields remaining, and the number of aliens needed to be killed before you meet the Death Satellites again. The graphics and sound were excellent and the differences in levels was good. Not exciting enough to play for hours but it is nice to go back to for a quick game on one of the higher levels. **S.F.**

Ratings Table

Program Quality	* * *
Ease of Use	* * * *
Graphics	* * * * *
Crashproofing	* * *
Supplied Instructions	* * * *
Overall	64%

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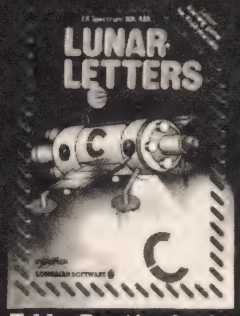

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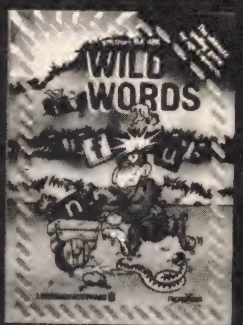

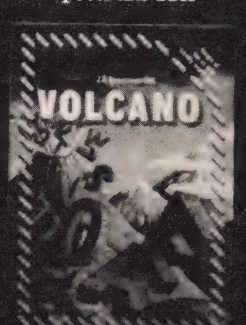

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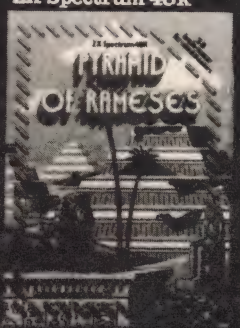

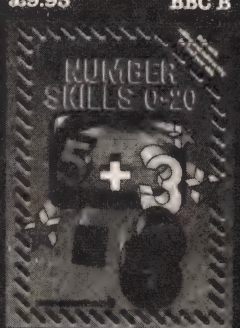

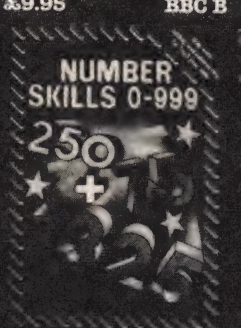

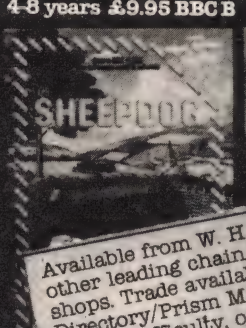

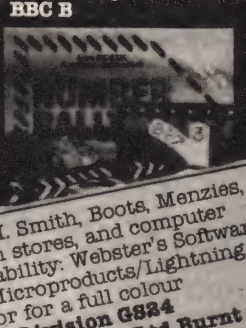

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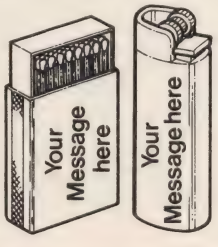

SOFTWARE

SNOW DROP

To neatly round off this January 'Christmas' edition, we've included this well-thought out game program by David Holmes.

This is a pleasant seasonal program for the unexpanded Texas TI-99/4A machine. The object of the game is to 'freeze' letters falling from the top of the screen if they are not present in the word shown at the bottom. For every letter that reaches the bottom of the screen, a point is lost.

The longer the word, the harder the game as the snowflakes holding the letters begin to thaw! Blocking a falling letter is simply a matter of hitting the corresponding key.

SPECIAL FEATURE

The computer responds in respect to the speed that the game is played. Play fast and the game will RUN — play slow to aquire a little thinking time.

This is achieved by the variable R in lines 170,980,1210 & 1230.

HOW IT RUNS

Lines 100-160	Zero variables.
Line 170	Search area row co-ordinate.
Lines 180-210	Reads data.
Lines 220-330	Screen colour & initialisation.
Lines 340-600	Selects, shuffles & displays word.
Lines 610-910	Main program, starts moving display & calls sub-routine.
Lines 920-1040	Search for letter.
Lines 1050-1390	Moves letter down & across screen. Checks for error.
Lines 1400-1460	Game over sound routine.
Lines 1470-1540	New game routine.
Lines 1550-1770	On error returns letter to top of display.
Lines 1780-1830	Updates error count.
Lines 1840-2300	Title sequence.
Lines 2310-2510	Prints instructions.
Lines 2520-2610	Changes screen colour during game.
Lines 2620-2680	To "print at" in TI BASIC

HINTS ON CONVERSION

All TI Basic Graphic and Sound commands are pre-fixed

"CALL" HCHAR or (A,B,C,D) A = row; B = column; C = ASC; D = repeats (if more than 1) VCHAR.

SCREEN(A) A = one of 16 colour codes.

COLOR(A,B,C) A = colour group; B = Foreground colour; C = Background colour.

GCHAR(A,B,C) A = row, B = column; C = ASC (Peeks at screen co-ordinates).

SOUND(A,B,C) A = duration; B = frequency; C = volume (0 = loudest).

KEY(A,B,C) A = TI keyboard format; B = ASC of key pressed; C = Logical Control.

PROGRAM LISTING

```
70 REM  SNOW DROP
80 REM  MEMORY 6.7K
90 REM  (C) DAVID HOLMES.
100 CALL CLEAR
110 OPTION BASE 1
120 ANSWER$=""
130 ALPHA$=""
140 TEMP$=""
150 DIM WORD$(20),F(18)
160 ERROR=0
170 R=6
180 RESTORE
190 FOR B=1 TO 20
200 READ WORD$(B)
210 NEXT B
220 CALL SCREEN(2)
230 CALL COLOR(2,16,1)
240 GOSUB 1840
250 IF K1<>89 THEN 270
260 GOSUB 2310
270 SC=6
280 GOSUB 2520
290 CALL CLEAR
300 PR$="PUZZLE UNDER CONSTRUCTI
ON"
310 ROW=12
320 COL=4
330 GOSUB 2620
340 RANDOMIZE
350 B=INT(RND*20)+1
360 TEMP$=WORD$(B)&WORD$(B)&WORD
$(B)
370 REM  SHUFFLE
380 FOR C=1 TO 18
390 D=INT(RND*18)+1
400 IF C<2 THEN 440
410 FOR E=1 TO C-1
420 IF D=F(E)THEN 390
430 NEXT E
440 F(C)=D
450 NEXT C
460 FOR G=1 TO 18
470 ALPHA$=ALPHA$&SEG$(TEMP$,F(G
),1)
480 NEXT G
490 CALL CLEAR
500 PR$=ALPHA$
510 ROW=2
520 COL=2
530 GOSUB 2620
540 PR$=WORD$(B)
550 ROW=24
560 COL=29-LEN(WORD$(B))
570 GOSUB 2620
580 CALL COLOR(13,1,1)
590 CALL VCHAR(22,29,129)
600 REM   INITIALIZATION END
610 REM   MAIN PROGRAM START
620 H=INT(RND*6)+1
630 J=ASC(SEG$(WORD$(B),H,1))
640 GOSUB 920
650 CALL GCHAR(Y+1,X,G4)
660 IF G4=32 THEN 770
670 N=1000
680 FOR M=Y+1 TO 21
```

SNOW DROP

```
690 CALL VCHAR(M,X,32)
700 CALL SOUND(1,N,0)
710 N=N-50
720 CALL VCHAR(M+1,X,42)
730 NEXT M
740 CALL VCHAR(22,X,32)
750 GOSUB 2520
760 GOTO 620
770 GOSUB 1050
780 IF G1<>32 THEN 620
790 IF K1=J THEN 620
800 CALL GCHAR(24,X,G5)
810 IF INT(G5+.5)<>INT(J+.5)THEN
 900
820 CALL SOUND(10,660,0)
830 CALL SOUND(10,880,0)
840 CALL SOUND(20,660,0)
850 ANSWER$=CHR$(J)&ANSWER$
860 IF ANSWER$=WORD$(B)THEN 880
870 GOTO 620
880 GOSUB 1390
890 GOTO 100
900 GOSUB 1550
910 GOTO 620
920 REM  SEARCH FOR LETTER
930 Y=2
940 FOR X=2 TO 19
950 CALL GCHAR(Y,X,G6)
960 IF G6=J THEN 1040
970 NEXT X
980 FOR Y=R TO 4 STEP -2
990 FOR X=2 TO 19
1000 CALL GCHAR(Y,X,G6)
1010 IF G6=J THEN 1040
1020 NEXT X
1030 NEXT Y
1040 RETURN
1050 REM  MOVES LETTER DOWN SCRE
EN
1060 CALL GCHAR(Y+2,X,G1)
1070 IF G1<>32 THEN 1380
1080 CALL VCHAR(Y,X,32)
1090 CALL SOUND(50,-3,5)
1100 CALL VCHAR(Y+2,X,J)
1110 IF Y+2=22 THEN 1260
1120 CALL KEY(0,K1,S1)
1130 IF S1=0 THEN 1170
1140 IF K1<>J THEN 1170
1150 CALL SOUND(100,880,5)
1160 GOTO 1190
1170 Y=Y+2
1180 GOTO 1060
1190 CALL GCHAR(Y+3,X,G2)
1200 IF G2<>32 THEN 1380
1210 IF R<Y+2 THEN 1230
1220 GOTO 1240
1230 R=Y+2
1240 CALL VCHAR(Y+3,X,42)
1250 GOTO 1380
1260 CALL SOUND(50,-3,5)
1270 S=X
1280 T=0
1290 CALL HCHAR(22,X,J)
1300 CALL GCHAR(22,X+1,G3)
1310 IF (G3<>32)*(G3<>42)THEN 13
70
1320 CALL HCHAR(22,X,42)
1330 CALL SOUND(5,550,5)
1340 X=X+1
1350 T=T+1
1360 GOTO 1290
1370 CALL HCHAR(22,S,32,T)
1380 RETURN
1390 REM  END OF GAME
1400 FOR DELAY=1 TO 250
1410 NEXT DELAY
1420 FOR LOOP=1 TO 3
1430 CALL SOUND(10,660,0)
1440 CALL SOUND(10,880,0)
1450 CALL SOUND(20,660,0)
1460 NEXT LOOP
1470 REM
1480 FOR DELAY=1 TO 850
1490 NEXT DELAY
1500 CALL CLEAR
1510 PRINT "PRESS ANY KEY FOR NE
W GAME"
1520 CALL KEY(0,K2,S2)
1530 IF S2=0 THEN 1520
1540 RETURN
1550 REM  RETURNS LETTER TO TOP
LINE
1560 FOR LOOP=1 TO 8
1570 CALL VCHAR(22,X,32)
1580 CALL SOUND(5,-3,0)
1590 CALL SOUND(5,-1,0)
1600 CALL VCHAR(22,X,J)
1610 NEXT LOOP
1620 SOUND=1000
1625 CALL VCHAR(22,X,32)
1630 FOR UP=21 TO 1 STEP -2
1640 CALL SOUND(-1,SOUND,0)
1650 CALL VCHAR(UP,X,J)
1660 SOUND=SOUND+50
1670 CALL VCHAR(UP,X,42)
1680 NEXT UP
1690 FOR Q=X TO S STEP -1
1700 CALL SOUND(-1,SOUND,0)
1710 CALL HCHAR(1,Q,J)
1720 SOUND=SOUND-50
1730 CALL HCHAR(1,Q,42)
1740 NEXT Q
1750 CALL VCHAR(2,S,J)
1760 CALL HCHAR(1,1,32,32)
1770 CALL VCHAR(1,X,32,22)
1780 ERROR=ERROR+1
1790 PR$=STR$(ERROR)
1800 ROW=2
1810 COL=30
1820 GOSUB 2620
1830 RETURN
1840 REM     DISPLAY TITLES
1850 FOR W=9 TO 12
1860 CALL COLOR(W,2,1)
1870 NEXT W
1880 REM  ENTER THESE PRINT  LIN
ES IN LOWER CASE LETTERS THE ! R
EPRESENT SPACES,     ENTER THEM
AS SPACES.
1890 PRINT "!!!AAAAA!I!!!I!@@@@@
!Y!!!Y"
1900 PRINT "!!!A!!!!!II!!I!@!!@
!Y!Y!Y"
1910 PRINT "!!!AAAAA!I!I!I!@!!@
!Y!Y!Y"
1920 PRINT "!!!!!!!A!I!!II!@!!@
!Y!Y!Y"
1930 PRINT "!!!AAAAA!I!!!I!@@@@@
!!Y!Y!"
1940 PRINT
1950 PRINT
1960 PRINT "!!!YYYYY!@@@@@!IIIII
!AAAAA"
1970 PRINT "!!!!Y!!Y!@!!@!I!!!I
!A!!!A"
1980 PRINT "!!!!Y!!Y!@@@@@!I!!!I
!AAAAA"
1990 PRINT "!!!!Y!!Y!@!!@!!I!!!I
!A!!!!"
2000 PRINT "!!!YYYYY!@!!@!IIIII
!A!!!!"
2010 REM  CHANGE BACK TO
      UPPER CASE LETTERS
2020 PRINT ::::
2030 CLR=4
2040 PR$="INSTRUCTIONS?"
2050 ROW=24
2060 COL=10
2070 GOSUB 2620
2080 FOR LOOP=1 TO 4
2090 CALL COLOR(9,CLR,CLR)
2100 CALL COLOR(10,CLR+2,CLR+2)
2110 CALL COLOR(11,CLR+4,CLR+4)
2120 CALL COLOR(12,CLR+6,CLR+6)
2130 RANDOMIZE
2140 RW=INT(RND*24)+1
2150 CL=INT(RND*32)+1
2160 CALL GCHAR(RW,CL,G7)
2170 IF G7<>32 THEN 2190
2180 CALL VCHAR(RW,CL,42)
2190 CLR=CLR+2
2200 IF CLR>10 THEN 2220
2210 GOTO 2260
2220 CLR=4
2230 FOR P=3 TO 8
2240 CALL COLOR(P,16,2)
2250 NEXT P
2260 CALL KEY(0,K1,S1)
2270 IF S1<>0 THEN 2300
2280 NEXT LOOP
2290 GOTO 2080
2300 RETURN
2310 REM  INSTRUCTIONS
2320 CALL CLEAR
2330 CALL SCREEN(2)
2340 PRINT "TRY TO MATCH THE WOR
D IN THE"::
2350 PRINT "BOTTOM CORNER OF THE
 SCREEN"::"BY ALLOWING ONLY THE
LETTERS"::"THAT MAKE UP THE WORD
"::
2360 PRINT "TO MOVE DOWN THE SCR
EEN":::"PRESS ANY KEY":
2370 CALL KEY(0,K,S)
2380 IF S=0 THEN 2370
2390 CALL CLEAR
2400 PRINT "KEY IN THE LETTER TO
 STOP IT"::"FALLING.":::"A SNOWFL
AKE WILL BLOCK THE"::"COLUMN.":::
2410 PRINT "BEWARE...SNOWFLAKES
MELT"::"AND THE LETTERS MAY STAR
T"::"TO MOVE AGAIN":::
2420 PRINT "PRESS ANY KEY":
2430 CALL KEY(0,K2,S2)
2440 IF S2=0 THEN 2430
2450 CALL CLEAR
2460 PRINT "AN ERROR COUNT IS DI
SPLAYED"::"TRY TO COMPLETE THE W
ORD"::"WITHOUT ANY ERRORS.":::
2470 PRINT "REMEMBER YOU ARE TRY
ING TO"::"SPELL THE WORD BACKWAR
DS...":::
2480 PRINT "PRESS ANY KEY"::
2490 CALL KEY(0,K4,S4)
2500 IF S4=0 THEN 2490
2510 RETURN
2520 REM   SET SCREEN COLOUR
2530 SC=SC+1
2540 IF SC>15 THEN 2590
2550 IF (SC=5)+(SC=10)+(SC=12)+(
SC=4)THEN 2570
2560 GOTO 2600
2570 SC=SC+1
2580 GOTO 2600
2590 SC=3
2600 CALL SCREEN(SC)
2610 RETURN
2620 REM  PRINT AT ROUTINE
2630 FOR AA=1 TO LEN(PR$)
2640 BB=ASC(SEG$(PR$,AA,1))
2650 CALL HCHAR(ROW,COL,BB)
2660 COL=COL+1
2670 NEXT AA
2680 RETURN
2690 DATA OPAQUE,FLIGHT,JINGLE,H
EROIC,TIMBER,METHOD,TONGUE,HOMAG
E,JETSAM,PENCIL,PRIMUS,HEALTH,IM
PART,STREAM
2700 DATA SQUEAK,SQUARE,CENTRE,T
HWART,PUNISH,TRAVEL
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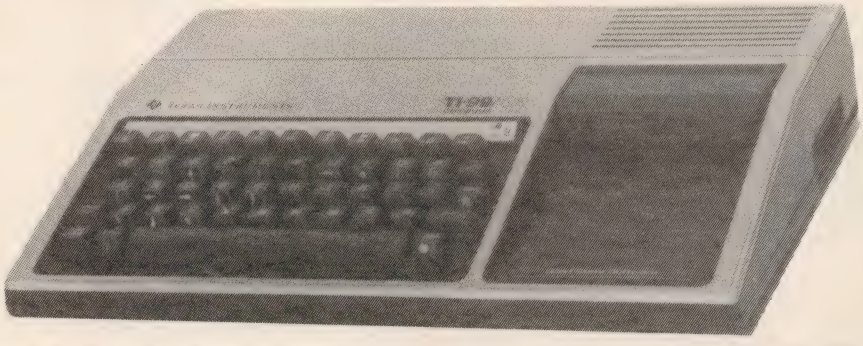


AT LAST, A HOME COMPUTER THAT IMPROVES WITH AGE.

It's surprising how many first-time relationships with a home computer go sour with age.

You buy an attractive, discounted little machine so that you and the children can learn about computers.

Instead, you learn about its limitations: the dull graphics. The plugs that fall out. The cheap power supply. The unalterable "beginners" language. The stiff, fragile keys. No provision for future developments. If only you'd looked around a bit in the beginning... *"Quality costs a little more, but it's usually worth paying for"* (Personal Computer News – CGL M5 Review, June '83.)

The CGL M5 is designed and built by Sord, one of Japan's leading computer specialists, with three main ideas in mind.

First, to be easy and fun to learn and operate.

Second, to be rugged enough to last through hours and hours of operation.

And third, to form the basis of a powerful, versatile home computer system that won't need replacing until you're ready for a dedicated business system.

Built to learn

The CGL M5 is designed to be easy for non-geniuses to use.

"On the M5, most of the work is done for you, and all that is left is the need to work out what to do next, rather than how to do it." (Personal Computer News, June '83.)

If you make a mistake, you can correct it with a simple movement of the cursor. So you only correct that mistake, not a whole line; nor do you have to indulge in complex edit commands.

Budding video game designers and computer artists will love to get their hands on the 16 colour graphics and 32 moveable images called "sprites."

"The M5 makes professional graphic effects very simple for even the beginner to achieve." (Personal Computer World, Aug. '83.)

Built to last

"It works first time, doesn't need a lot of mollycoddling and jiggery-pokery to persuade it to continue to do so, and what's even better, it continues to work well. You don't have to balance cold cartons of milk on the top, shove matches in the back to keep the plugs in, or press the keys with several pounds force to make them respond." (Personal Computer News, June '83.)

Being able to build things that work and carry on working without endless maintenance is something at which the Japanese seem to excel.

Built to grow

To be truly versatile, a home computer has to understand very different things.

So you need different "languages," which the M5 provides by supplying part of its memory in plug-in cartridges.

"The M5 eliminates the worst limitations on machines at this level, which is that they tend to be stuck with whatever language is provided by the management." (Personal Computer News, June '83.)

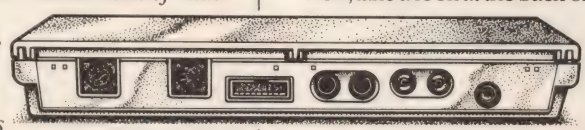
The computer is supplied complete with a Basic-I cartridge, a standard integer BASIC language and a simple learning text.

Plug in the Basic-G cartridge, and you can access the M5's incredibly sophisticated graphic and sound capabilities which are far in advance of similarly-priced computers.

Move on to the Basic-F cartridge, and you have scientific, technological and statistical computing power usually available only on big computers with equally big price tags.

The FALC cartridge provides a tailor-made language for data management, spreadsheet accounts and business problems. Combine FALC with a disc and you could *"turn the M5 into a small business machine"*. (Personal Computer Magazine, August '83.)

Now, take a look at the back of the M5.



Notice the sockets (usually an extra) for a standard Centronics-type printer, the separate video monitor and hi-fi sound output.

Even the language cartridge socket has hidden potential:

"Unlike most such sockets, this one has 56 internal lines connected to it giving access to just about every function in the computer. This means that just about everything you can think of can be added onto the computer, ranging from a Prestel interface to second processor to use as an intelligent terminal on a timesharing computer"... (Electronics – The Maplin Magazine, March '83.)

Take a look at the home computer that will improve with age.

For a full technical specification of the CGL M5, details of the wide range of supporting software and to find out where to see a complete demonstration, send the coupon to: CGL, CGL House, Goldings Hill, Loughton, Essex IG10 2RR. Telephone number: 01-508 5600.

I'd like to know more about the CGL M5. Please send me a brochure and a list of dealers.

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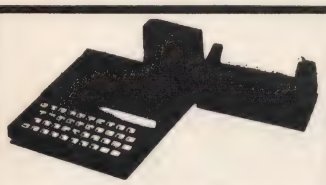

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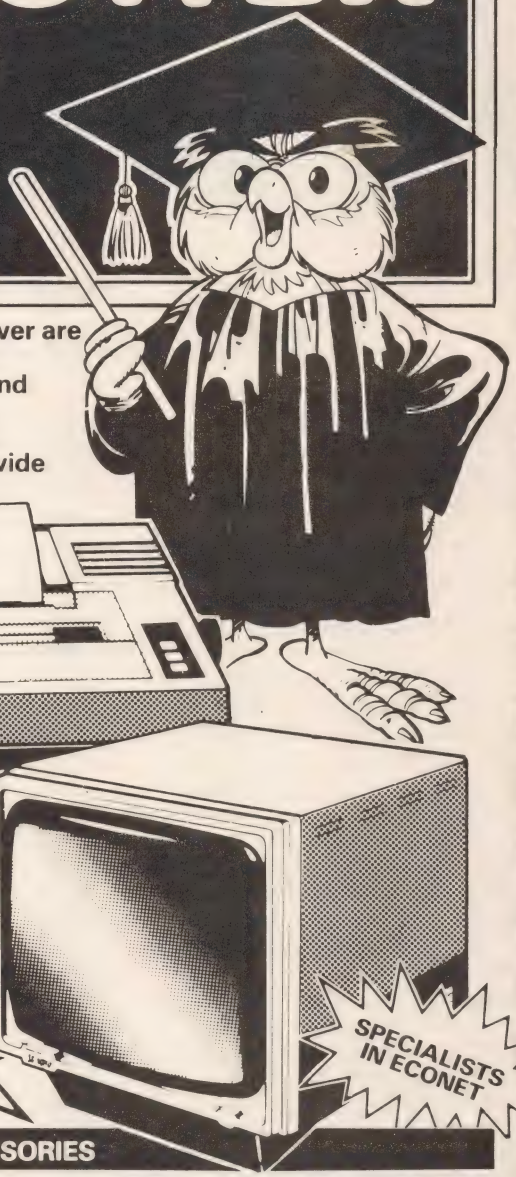

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PERIPHERALS

ADD ONS

The New Year promises to be bountiful in terms of interesting and useful peripherals.

MICRO TALKER

Manufacturer: R.P.S. Electronics
Price: £59.16 all inclusive

This speech synthesiser is intended for use with the BBC Microcomputer and plugs directly into the user port on the front underside of the machine. Explicit instructions accompany the hardware and ensure that safely setting up the Micro Talker should prove no problem.

The Micro Talker unit has one other connection port, a standard five pin DIN (much more useful than some of the jack connections on its rivals). This enables the unit to be linked to the amplifier in your hi-fi system or wherever, so that you can broadcast electronic speech to your neighbours.

There are three main methods of creating computerised speech currently available. Digitised speech is what you get when you buy Kenneth Kendall's voice in ROM. Linear Predictave Coding is a complex mathematical method which also involves prerecording and storing a set of words. Micro Talker uses neither of these means, but the third method, which is generally preferred by manufacturers at this end of the market: allophone synthesis.

Allophones are the basic sounds of human speech and they can be combined to form words. The hardware that goes to make up Microtalker is an electronic model of the human vocal tract. It is up to the programmer (you, the user) to put the words into its mouth.

The main advantages of this method are the low data rate (ideal for low memory micros) and the theoretically unlimited vocabulary. This of course depends on the stamina of the user and how good the supplied software is. This is where Microtalker really scores. The documentation is comprehensive and includes advice on using the allophone set as well as listing the address table with sample words and duration for each sound. This table can be used in association with the R.P.S. Wordmaker program which assembles the allophones which you input (and it will accept X rated language so make sure your Mum is out of the house) and creates a dictionary.

A more advanced piece of software comes in the form of a Speaker program, which has a precompiled word table (which is fairly comprehensive if you are always talking about computers). This enables sentences and speeches (more stamina) to be entered using the supplied combination of pauses. The software is supplied on cassette.

The price given is for mail order direct from R.P.S. and includes postage and packing. The Micro Talker is now also available from shops. Further details from:
R.P.S. Electronics, Unit C200, Saltaire Workshops, Ashley Lane, Shipley, Yorkshire, BD17 7SR. Tel: (0274) 588310.

TAC 2 JOYSTICK

Manufacturer: Suncom, Consumer Electronics Ltd
Price: £18.95

TAC stands for 'Totally Accurate Controller' — there's confidence for you — and the product is being marketed as a superior joystick.

Unlike most of the high quality (by this I mean expensive on the whole) joysticks around, it has a very small throw. The product is solidly constructed with a chrome steel shaft topped with a small plastic ball. There is a square base with rounded edges and FIRE buttons for left and right handed play. Unlike the stick control the FIRE buttons are not very sensitive and do not have sufficient spring. The extra sensitivity in the joystick shaft is achieved by replacing the more general leaf switches in the base of the shaft by squares of metal.

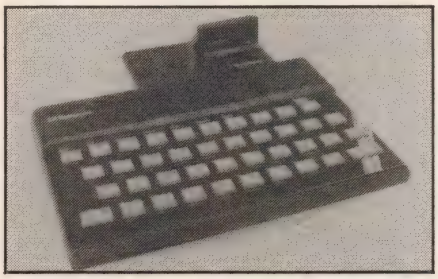
I found the joystick to be the best I've ever used with one small criticism and that is my dislike of the patterning around the base — something that doesn't detract from superior control and hence better scores!

The joystick is available from **Consumer Electronics Ltd, Princess Street, Failsworth, Manchester M35 0HS** and leading computer retailers.

SINCLAIR ZX INTERFACE 2

Manufacturer: Sinclair Research
Price: £19.95

The ZX Interface 2 is one of the bundle of goodies recently released by the Sinclair Company. It allows a player to use two Atari-type joysticks and to run the new Sinclair plug in ROM cartridges, of which a range of



games and utilities are to be released soon.

The interface stimulates the number keys 1 to 5 for the first joystick and 6 to 0 for the second; the order being LEFT, RIGHT, DOWN, UP and FIRE. However the documentation recommends using IN61438 and IN61486 in preference to INKEY. Our review interface was generally well-constructed in all but the edge connectors; these will be improved in the production models. The plug in ROM cartridges are neat little packages, very small and protected by a layer of rubber which is pushed out of the way on connection. At £14.95 these cartridges are not cheap and demand may be limited but the titles are good and many more are promised including some programs not available on tape.

Because the plug-in ROM is separate from the computer's RAM, a game which requires 48K on tape will run on a 16K Spectrum with the interface 2. This may allow much more complicated programs to be written using all the 48K or the machine's RAM. The interface is a worthwhile add on giving scope for increasing the power of the Spectrum at a typically low Sinclair price. However, I feel that the ROM cartridges are expensive and this may be a factor restricting most of us from taking advantage of this neat package.

The interface is available from Sinclair dealers nationwide or telephone **0223 353204** for stockists.

ORIC COLOUR PRINTER/PLOTTER MCP40

Manufacturer: Oric Products International
Price: £169.95 (see also below)

The first of Oric's long promised peripherals are finally becoming available and it looks as if the Company is at last beginning to improve in terms of reliability of delivery.

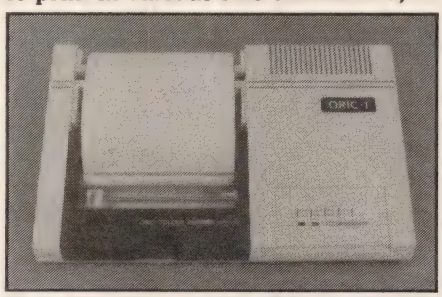
The first peripheral to have reached production is the four colour printer/plotter. The idea is not new, Tandy have had a similar machine on the market for years and other manufacturers are just beginning to realise its potential with Atari and Commodore bringing out similar models. The actual mechanism of the MCP40 is similar to that of the Sharp MZ700 machine.

Dashing Design

Externally, the plotter is very smart and finished in colours to match the Oric 1. An on/off switch is situated on the side (useful since the machine plugs directly into the mains) and buttons on the top control line feed, colour select and pen change. LEDs serve as POWER ON and PAPER END indicators. Connection to the Oric micro is by a narrow centronics parallel cable. The whole unit is neat and has a very professional and sophisticated look about it.

Feeding paper into the rollers is simplicity itself. Just present the straight edge of the paper to the roller, lift the lid above the pen drum and hold down the line feed button for the paper to feed in all by itself. It is necessary to lift the lid when switching on to prevent the self test from drawing on the roller. There are two self tests built into the MCP40, the first is triggered by switching on and draws four 1cm squares, one in each colour which is useful for getting the ink flowing in the pens. The other is a full printout of the character set and is triggered in the usual way by holding down line feed when switching on.

Being such a flexible gadget, the MCP 40 has a wide range of commands which are all sent from BASIC using LPRINT. These commands can be divided roughly into graphic and text commands and can be switched using LPRINT CHR$ (17) to get into the text mode and LPRINT CHR$ (18) for the graphic mode. The text command allows you to print in various size characters, in



four directions and in all four colours.

The graphic commands are much more powerful and give control over line type from solid lines to dots with short and long dashes between. You can draw and move to absolute and relative positions over a width of 480 steps and to a depth of 999 steps. The only 'macro' command similar to those found on larger, more expensive plotters, is one to set up and draw the axis. The origin can be moved so that negative x coordinates can be used as well as negative y coordinates. Printing usually resets the head to the beginning of the line so that you have a print in graphic mode option which allows you to mix graphics and text more easily.

Flaws

Two flaws mar the overall brilliance of this product. The first is the unreliability of the cut down centronics port which results in spurious data being sent. This is not so bad in a listing job (you can always relist and get a correct listing for that section), but on a large complicated plot (such as a graphic design), one point out of place will spoil the whole pattern which may have taken ages to build up.

The second major fault is in the documentation. The plotter/printer is a complex product, probably being used by beginners to computing, who need to be taken step by step through the way it works. Examples would be a help. The 32 page Operation Manual skimps on detail, particularly on points of syntax where things can go wrong. There are no details on how to use variables which is something the MCP40 is very fussy about. LPRINT "D100,100" is valid, as is L PRINT "D100, 100" but A$ = "D100," + STR$(100) is not valid — you have to strip leading spaces from concatenated strings.
However, once this is realised, you can generate some wonderful patterns and a huge paper bill.

Conclusions

The MCP40 is a nice toy. It cannot be considered as an alternative to a dot matrix printer unless the print loads are light and the operator has a lot of patience. The print speed of 12 cps is very slow, but the print quality and the choice of 40 or 80 character width, along with its neatness make the MCP40 a very attractive buy. Oric are currently increasing its appeal by knocking £40 off the price when bought in conjunction with the 16K Oric 1 home computer by mail order from **Tansoft, Units 1&2, Techno Park, Newmarket Rd, Cambridge.**

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It is of course no coincidence that the BBC Micro is being consistently chosen by schools (and by universities, scientific institutions and business). Nor that it has become one of the top selling computers for the home.

The magazine Which Micro put it rather succinctly in its February issue this year: "The BBC Micro (has) an unrivalled potential for business, educational and serious home applications."

It is, in effect, a home computer with the capacity to do a lot more than you'd expect from a home computer.

It can play games; it can help the children with their homework (there's a huge range of educational software available); it can help with everything from gardening to book keeping.

In fact, it has been called the ultimate home help. But it's a home help with a degree in business administration.

It can, for example, become a word processor and even has the facility to link economically with other BBC Micro's for more sophisticated business use.

With suitable adaptors, it can turn your TV into a Teletext receiver. Programs can also be downloaded from Teletext and Micronet/Prestel transmissions.

Perhaps we can let the reviewer in Video World (Feb '83) have the last persuasive word: "BBC Microcomputers are the limousines of home computers... that would not disgrace the home of a professional."

The BBC Micro costs £399. It is simple to set up (virtually any TV set and cassette player is all you need) and simple to use.

It comes with a comprehensive, step-by-step User Guide which introduces the Micro and shows you how to construct useful programs of your own.

You will also receive a free "Welcome" cassette which contains 15 different programs to experiment with.

It is available from W H Smith Computer shops, Boots, John Lewis and local Acorn stockists.

If you would like to order one with your credit card or if you want the address of your nearest supplier, just phone 01-200 0200 anytime or 0933-79300 during office hours.

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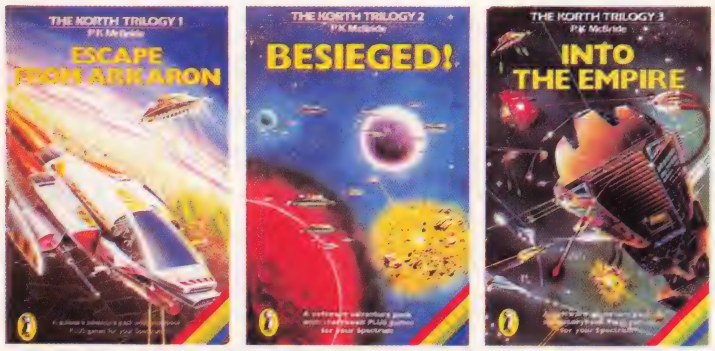

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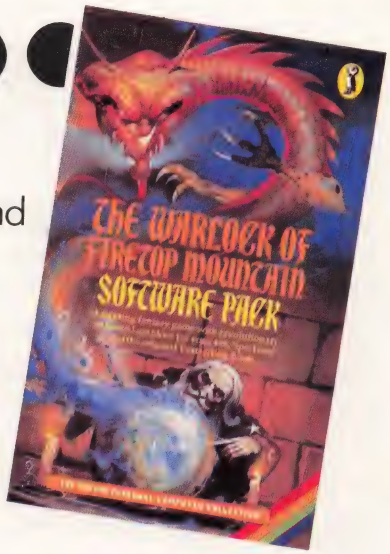

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SOFTWARE

POWER MERGE

Run together a suite of your favourite programs and utilities with this short program by R. Meehan.

It is often convenient to run together two or more BASIC programs as a single program. This short listing enables you to carry out such 'merging'.

Merge Operation

The following procedure should be followed in order to chain program 'B' onto the end of program 'A':

1) Make sure you have copies of both programs on tape — if not, type them in and make copies now.
2) After a NEW command, either type in the above program or CLOAD it from tape, if you already have a copy. If you wish to make a tape copy to avoid having to retype the program each time you wish to use it, do so **now**.
3) RUN the program. A section of memory is set aside by line 10 to hold the machine code routines represented by the numbers of lines 40 and 50. Lines 20 and 30 store the code at the chosen memory locations.
4) Enter a NEW command. This will get rid of the BASIC program, but don't worry — the all-important machine code, which does all the work, is still safe in protected memory.
5) CLOAD program 'A'.
6) Type in EXEC 32749. If you now LIST, it will appear that program 'A' is no longer in memory. This is merely because the BASIC interpreter has been 'fooled' by our machine code program into believing that there is nothing there, so that it does not obliterate program 'A' when the next instruction (a CLOAD) is carried out.
7) CLOAD program 'B'.
8) RENUMber program 'B' so that its first line number is greater than the last line number in program 'A' (if you do not have a listing or program 'A' and forgot to make a note of the last line number before step six, play safe by renumbering from a high line number and with a low line increment e.g. RENUM 30000,1.
9) Type in EXEC 32760. This restores program 'A', and tags program 'B' onto the end. A LIST will show the new, combined program in its entirety, and you may now CSAVE, RUN, or whatever you wish. (A CSAVE of the new program at this stage is recommended, unless you wish to go through the whole process each time you need the combined program).

If you now wish to merge a third program with the two already combined, start again at step six, treating the program now in memory as program 'A', and that which you wish to add on, as program 'B'.

Note that each part of a combined program will take up no less memory than it did as a separate program, so you will quickly find yourself running out of memory if you try merging more than two programs (even merging two 12K programs is likely to give you an OM error when the new program is RUN).

PROGRAM LISTING

```
10 CLEAR 19,32748
20 FOR A = 32749 TO 32765
30 READ B: POKE A,B: NEXT A
40 DATA 148, 25, 175, 140, 12, 158, 27, 48, 30, 32, 3
50 DATA 174, 140, 3, 159, 25, 57
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SOFTWARE

OUT WITH A BANG

End your program on an interesting note with this simple routine by Jonathan Holden.

This machine code program for the Sinclair Spectrum (16 or 48K) is designed as a finishing touch to a BASIC game or other program. It provides a more interesting ending than the usual stagnant congratulatory message.

The screen is divided into eight bands of three lines each, using the eight colours available on the Spectrum. The value held in the attributes file are successively changed to alter the colour of each band in turn. The routine is called in at the end of a BASIC program by the command RAND USR 31000.

A machine code loader is given below with the machine code held in DATA statements. Pressing 'Y' when prompted causes a return to BASIC; pressing 'N' causes a system restart.

Notes On Use

Put lines 10 to 70 at the beginning of the program as in a loader program. Start your own program at line 100.

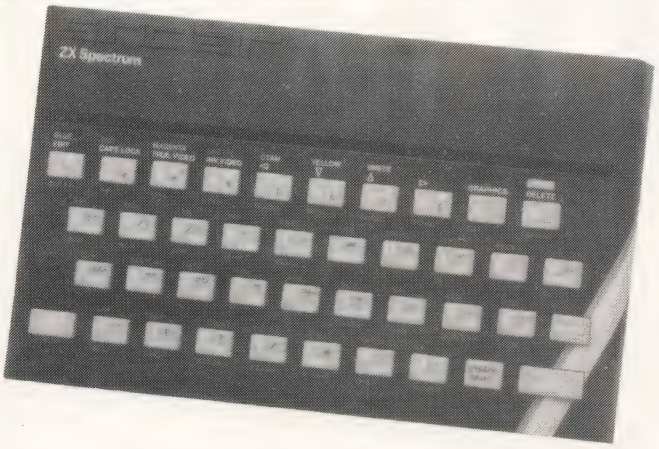
Instead of using an INKEY$ at the end of the program when asked continue Y or N, put RAND USER 31000. The screen will then flash and the message will appear from the machine code routine. If you then type 'N' the program will NEW; typing 'Y' will tell it to carry on.

Hints On Conversation

The program is not easily transferred to other machines as it uses the Spectrum ROM. It may be relocated in memory but all absolute 'jump' instructions must be recalculated.

▶

OUT WITH A BANG



```
Addr        Mnemonics          Hex
            ORG 31000
            LOAD 31000
            SCREEN:EQU 16384
            ATTRFILE:EQU 22528
7918 LD HL,SCREEN              210040
791B PUSH HL                   E5
791C POP DE                    D1
791D INC DE                    13
791E LD BC,6144                010018
7921 LD(HL),0                  3600
7923 LDIR                      EDB0
7925 LD(HL),64                 3640
          BIGLOOP:EQU BIGLOOP
7927 LD B,8                    0608
7929 PUSH BC                   C5
792A LD BC,96                  016000
792D LD A,(HL)                 7E
792E ADD A,8                   C608
7930 CP 136                    FE88
7932 CALL Z,CORRECT            CC8979
7935 LD(HL),A                  77
7936 LDIR                      EDB0
7938 LD B,5                    0605
          THIRD:EQU THIRD
793A PUSH AF                   F5
793B LD A,223                  3EDF
793D IN A,(254)                DBFE
793F AND 16                    E610
7941 JR Z,DIS                  2849
7943 LD A,127                  3E7F
7945 IN A,(254)                DBFE
7947 AND 8                     E608
7949 JP Z,0000                 CA0000
794C POP AF                    F1
794D PUSH BC                   C5
794E LD B,0                    0600
          DELAY:EQU DELAY
7950 DJNZ DELAY                10FE
7952 POP BC                    C1
7953 DJNZ THIRD                10E5
7955 POP BC                    C1
7956 DJNZ SECOND               10D1
7958 LD A,2                    3E02
795A CALL 5633                 CD0116
          START:EQU START
795D DB 22                     16
795E DB 11                     0B
795F DB 3                      03
7960 DB'PRE'                   505245
     DB'SS '                   535320
     DB'Y O'                   59204F
     DB'R N'                   52204E
     DB' TO'                   20544F
     DB' CO'                   20434F
     DB'NTI'                   4E5449
     DB'NUE'                   4E5545
7978 LD DE,START               115D79
797B LD BC,27                  011B00
797E CALL 8252                 CD3C20
7981 LD HL,ATTRFILE            210058
7984 LD DE,ATTRFILE+1          110158
7987 JR BIGLOOP                189E
          CORRECT:EQU CORRECT
7989 LD A,64                   3E40
798B RET                       C9
          DIS:EQU DIS
798C POP AF                    F1
798D POP BC                    C1
798E POP BC                    C1
798F RET                       C9
                    END
```

PROGRAM LISTING

```
  10 DATA 33,0,64,229,209,19,1,0,24,54,0,237,176,54,64,6,8,197,1,96,0,126,198,8,
254,136,204,137,121,119,237,176,6,5,245,62,223,219,254,230,16,40,73,62,127,219,2
54,230,8,202,0,0,241,197,6,0,16,254,193,16,229,193,16,209,62,2,205,1,22,22,11,3,
80,82,69,83,83,32,89,32,79,82,32,78,32,84,79,32,67,79,78,84,73,78,85,69,17,93,12
1,1,27,0,205,60,32,33,0,88,17,1,88,24,158,62,64,201,241,193,193,201
  20 CLEAR 30999
  30 LET a=31000
  40 READ b
  50 POKE a,b
  60 LET a=a+1
  65 IF a=31120 THEN GO TO 100
  70 GO TO 40
 100 RANDOMIZE USR 31000
```

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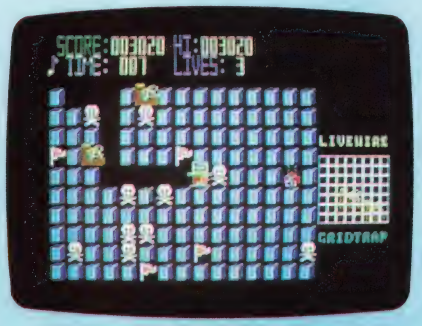

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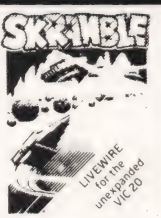

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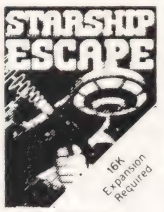

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After all, you cannot tell what will interest you most until you've tried everything computers can offer you.

Some others ask you to compare the technical facts. Well, to give them all a surprise we've published some of 32K Colour Genie's most important features.

But for the less technical, here are a few other important questions and answers.

WHY YOU CAN'T BUY A COLOUR GENIE AT THE CORNER SHOP

You see, ALL computers are more complex than they first appear.

So when you start computing, you do need a bit of help. A Saturday shop assistant is NOT the right person to go to.

To ensure that you obtain the answers to any doubts or questions you may have about computers, a list of the many Genie specialists appears below. But if you have any problem whatsoever, get in touch with us at Lowe Computers — we're here to help.

WHY OUR 32K CAN MEAN A LOT MORE THAN EVEN THE MOST RECENT COMPETITORS

It's easy to quote big memory numbers like 32K. In many other popular computers of that size, it is not so easy to use it all.

Even some of the newest models let you use little more than two thirds of the user memory. The other third is snatched away to drive the computer.

- Design efficiency. 95% of RAM is available for user memory
- 16K ROM with Microsoft Colour BASIC Extended
- Forth (optional)
- 256 predefined characters with 128 more you can program yourself. A massive 256 can be displayed at any one time
- Repeat operates on all 63 keys
- 4 function keys giving 8 user programmable statements
- Full editing and tracing facilities for de-bugging
- Screen resolution of 320 x 200 with text and graphics
- Or 160 x 102 individually addressable pixels in 4 colours
- Screen display, 25 rows of 40 characters
- 16 colours (8 full, plus 8 tints)
- 80 commands plus more than 40 graphics, arithmetic and special functions
- 8 octaves, independent on each of 3 separate sound channels with independent volume, duration and envelope on each channel
- Full synthesised sound effects via separate T.V. or Hi-Fi output ports
- Cartridge based software
- Prestel/Viewdata modem. Software cartridge loaded for fast system access
- Floppy disc system
- Superb digital joysticks, with numeric pads and two fire buttons.

Colour Genie has the type of "drive" facility that you would expect to find on a computer costing around £400. It uses less than 5% of RAM -giving you as much as 30K for more exciting games and more useful applications.

WHY GOOD PICTURES CAN BE MORE COLOURFUL ON THE COLOUR GENIE

Many other computers offer several modes. These give high resolutions but at a cost.

On some, high resolution uses so much RAM that you get only 2 colours,and very little memory left to play with.

But Colour Genie has got other ideas to let you have the good quality picture effect of high resolution (320 x 200 for the technical). AND FULL COLOUR

THIS IS HOW IT WORKS.

Colour Genie lets you create as many as 128 different shapes that it tucks away in its memory, in addition to the 128 shapes it has permanently stored (you can see 64 of them on the keys in the photograph).

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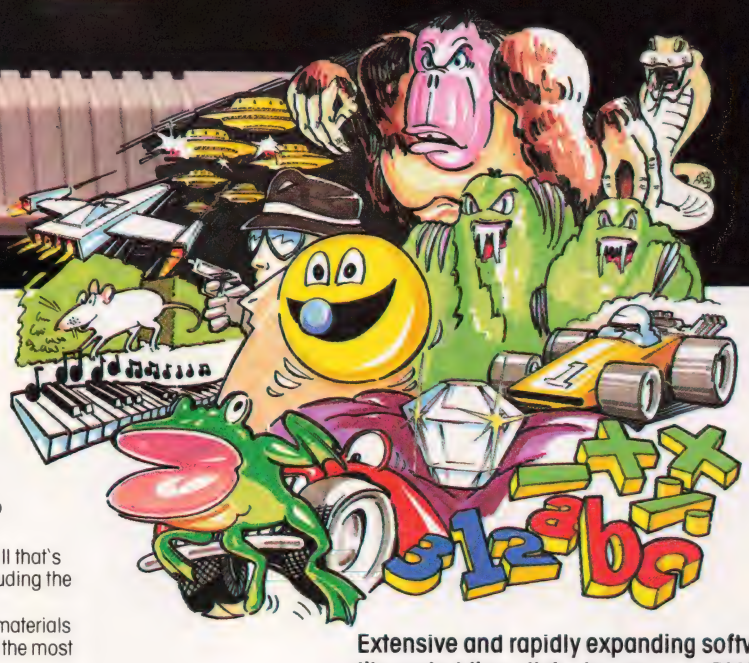

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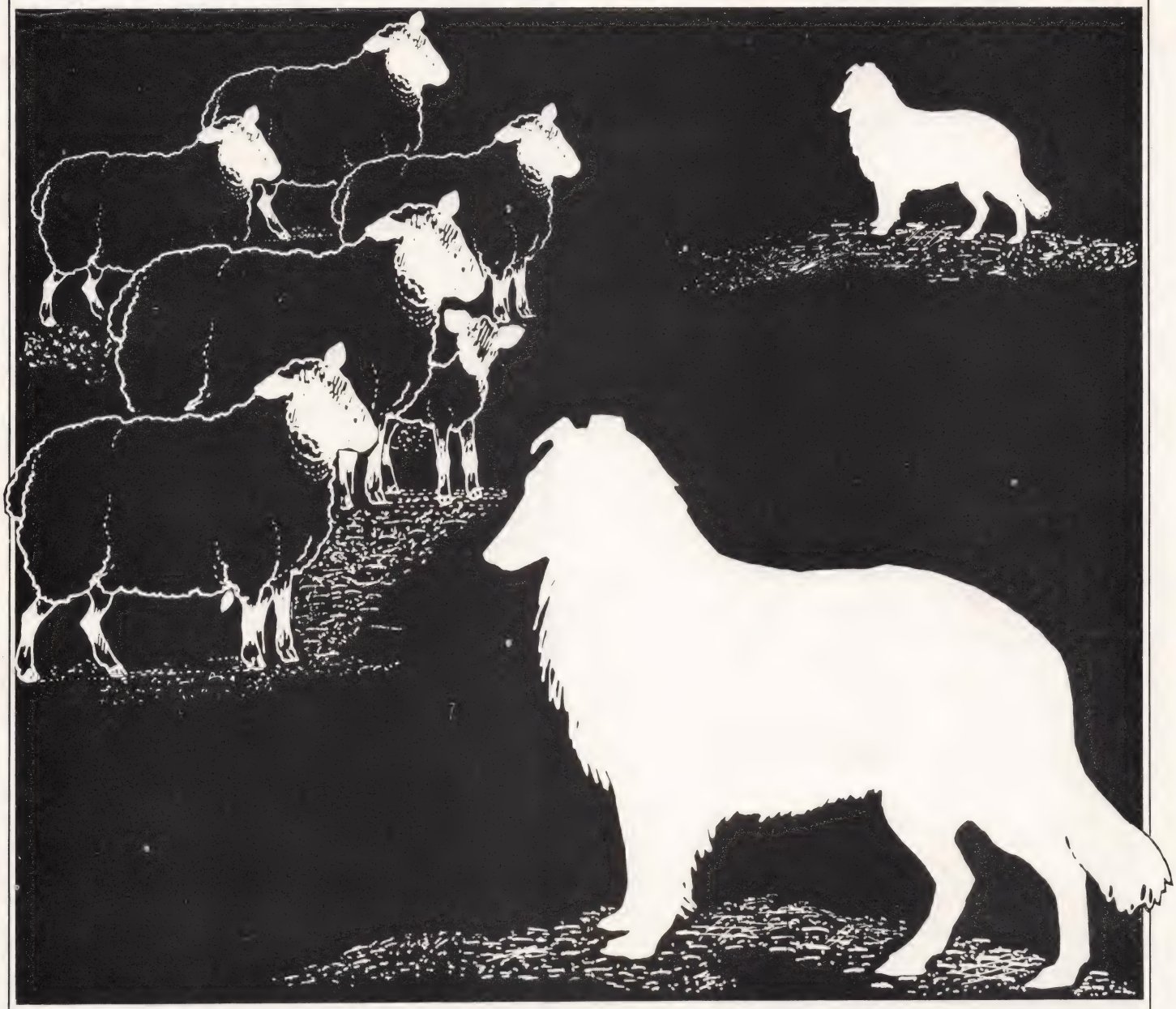
SHEEPDOG TRIALS



You all know the T.V. programme, now you can test your own skills against the sheep in this novel game by Richard Sheppard.

Sheepdog trials is a strategy/arcade game for the unexpanded VIC-20. You play the role of a sheepdog and your job is to round up between one and nine sheep into a pen in as short a time as possible. You control the dog with keys W,A,S and Z for moving up,left,right and down respectively. There is a choice of up to nine skill levels which affect the number of sheep to be rounded up.

If the dog is between one and four spaces away from a sheep in both the horizontal and vertical planes, then the sheep will move away from the dog. Any further and the sheep will wander at random, any closer and the sheep will panic.

When all the sheep are safely in the pen the time taken and the number of sheep rounded up will be displayed and the option for another try is given.

No User Defined Graphics are used in this program.

Variables Used

AA	Flag set if sheep is in position.
CO	Difference between character & colour POKES.
D	Dog's position.
DX,DY	Dog's x and y co-ordinates.
F	Flag set if all sheep are rounded up.
I,L,M,Q	Used in FOR-NEXT loops.
MV	Movement input.
PP	Screen position of centre of pen.
SC	Screen position of top left corner of field.
SK	Skill level/no. of sheep.
SX,SY	Sheep's x and y co-ordinates.
TI$	VIC's clock.
X,Y,X1,Y1	Sheep's temporary x and y co-ordinates.

HOW IT RUNS

Line 10	Sets up variables.
Line 30	Subroutine for a delay loop.
Line 40	Subroutine for footstep noise.
Lines 70-80	Open gate.
Lines 109-186	Sheep run into field.
Lines 190-192	Close gate.
Lines 220-280	Put pen in random position on screen.
Lines 300-350	Allow dog to have three moves.
Lines 410-560	Allows each sheep to have one move.
Lines 600-610	Pick a random direction for sheep to move when panicking and wandering.
Lines 700-750	End of game.
Lines 800-850	Make a noise if sheep is caught and checks for end of game.
Lines 851-891	Print the instructions.

HINTS ON CONVERSION

Conversion of this program is not recommended as it uses a lot of POKES and cursor controls for the VIC. However, here are some hints if you do want to:
The top-left corner of the screen on the VIC is 7680 and this increases by 22 for each line down.
197 & 198 are the keyboard buffer.
36874-36878 are the sound and volume.
36879 is the screen and border colours.
TI$ is the VIC's internal clock.

PROGRAM LISTING

```
10 TI$="000000":CO=30720:SC=7702:GOSUB851:GOTO70
30 FORI=1TO500:NEXT:RETURN
40 POKE36878,15:POKE36874,200:FORM=1TO10:NEXT:POKE36874,0:FORM=1TO70:NEXT:RETURN
70 GOSUB30:PRINT"
80 GOSUB30:PRINT"
109 FORI=1TOSK
110 SP(I)=INT(RND(1)*462)+23:IFPEEK(SP(I)+SC)<>32THEN110
130 X=0:Y=X:X1=X:Y1=X:SX=INT(SP(I)/22):SY=SP(I)-SX*22:IFSY=0THENSY=1:SP(I)=SP(I)
+1
135 POKESC+X*22+Y,32
140 IFSX>XTHENX1=X1+1
141 IFSY>YTHENY1=Y1+1
150 IFSX=X1ANDSY=Y1THENAA=1:GOTO162
151 IFPEEK(X1*22+Y1+SC)=32THEN162
160 IFPEEK(X1*22+Y1+SC)<>32ANDX1<>XTHENY1=Y1-1
161 IFPEEK(SC+X1*22+Y1)<>32ANDY1<>YTHENX1=X1-1
162 X=X1:Y=Y1
170 POKEX*22+Y+SC,94:GOSUB40:IFAA<>1THEN135
186 AA=0:NEXT:FORI=1TOSK:POKESP(I)+SC,94:NEXT
190 GOSUB30:PRINT"
192 GOSUB30:PRINT"
220 PP=INT(RND(1)*294)+24:D=PP:PP=PP+7680
223 FORI=0TO66STEP22:FORQ=1TO3:IFPEEK(PP+I+Q-23)<>32THEN220:NEXT:NEXT
250 POKEPP,96:POKEPP-1,97:POKEPP-22,226:POKEPP-23,236:POKEPP-21,251:POKEPP+1,225
251 POKEPP+CO+22,0:POKEPP+CO-1,6:POKEPP+CO-22,6:POKEPP+CO-23,6:POKEPP+CO-21,6
252 POKEPP+CO+1,6:POKEPP+CO+21,6:POKEPP+CO+23,6:POKEPP+23,254:POKEPP+21,252:POKE
PP+22,94
265 DX=INT(D/22):DY=D-DX*22
270 FORL=1TO4:FORM=180TO235STEP2:POKE36876,M:FORN=1TO10:NEXTN,M:POKE36876,0
280 FORM=1TO100:NEXTM,L
300 FORN=1TO3:POKE198,0:WAIT198,1:MV=PEEK(197):DX=INT(D/22):DY=D-DX*22
330 IFMV=9THENDX=DX-1
331 IFMV=17THENDY=DY-1
332 IFMV=41THENDY=DY+1
333 IFMV=33THENDX=DX+1
340 IFPEEK(DY+DX*22+SC)<>32THENNEXT:GOTO410
350 POKED+SC,32:POKED+CO+SC,1:D=DX*22+DY:POKED+SC,94:POKED+CO+SC,0:NEXT
410 FORN=1TOSK:IFSP(N)=0THENNEXT:GOTO300
420 XS=INT(SP(N)/22):YS=SP(N)-XS*22:Y=0:X=0
430 IFABS(DX-XS)>4ORABS(DY-YS)>4THEN600
440 IFABS(DX-XS)<2ANDABS(DY-YS)<2THEN600
450 IFDX>XSTHENX=-1
460 IFDX<XSTHENX=1
470 IFDY<YSTHENY=1
480 IFDY>YSTHENY=-1
490 XS=XS+X:YS=YS+Y
500 IFPEEK(XS*22+YS+SC)=96THENGOSUB800:NEXT:GOTO300
510 IFPEEK(XS*22+YS+SC)<>32THENNEXT:GOTO300
520 POKESP(N)+SC,32
530 SP(N)=XS*22+YS
540 POKESP(N)+SC,94
560 NEXT:GOTO300
600 X=INT(RND(1)*3)-1:Y=INT(RND(1)*3)-1
610 GOTO490
700 POKE36879,157:PRINT"
705 PRINT"
710 PRINT"
720 PRINT"
725 FORI=1TO250:NEXT:POKE198,0
730 GETAN$:IFAN$=""THEN730
740 IFAN$="Y"THENRUN
750 PRINT"
800 POKESP(N)+SC,32
801 POKEPP,94
809 FORL=1TO10:FORM=250TO240STEP-1:POKE36876,M:NEXT:FORM=240TO250:POKE36876,M
810 NEXTM:POKE36876,0:NEXTL:POKE36876,0
820 POKEPP,96
830 SP(N)=0
840 F=0:FORT=1TOSK:F=F+SP(T):NEXT:IFF=0THEN700
850 RETURN
851 POKE36879,168:POKE36878,4
852 PRINT"
853 PRINT"
854 GETA$:I=INT(RND(1)*60)+180
855 POKE36876,I:FORX=1TO600:NEXT
856 POKE36876,0
857 IFA$=""THEN854
858 IFA$="N"THEN880
859 POKE36879,232
860 PRINT"
861 PRINT" IF YOU GET TOO CLOSE  TO A SHEEP IT WILL    PANIC"
862 PRINT"
863 PRINT"
864 PRINT"
865 GETSK$:IFSK$=""THEN865
866 PRINT"
867 PRINT"
868 PRINT"
869 PRINT"
870 PRINT"
871 PRINT"
872 PRINT"
873 GETSK$:IFSK$=""THEN873
880 PRINT"
883 FORI=1TO5:FORC=1TO3:PRINT"
884 PRINT"
885 PRINT"
886 FORI=0TO44:POKE8142+I,96:NEXT
887 PRINT"
888 GETSK$:IFSK$=""THEN888
890 SK=VAL(SK$):IFSK<1ORSK>9THEN887
891 PRINT"

READY.
```

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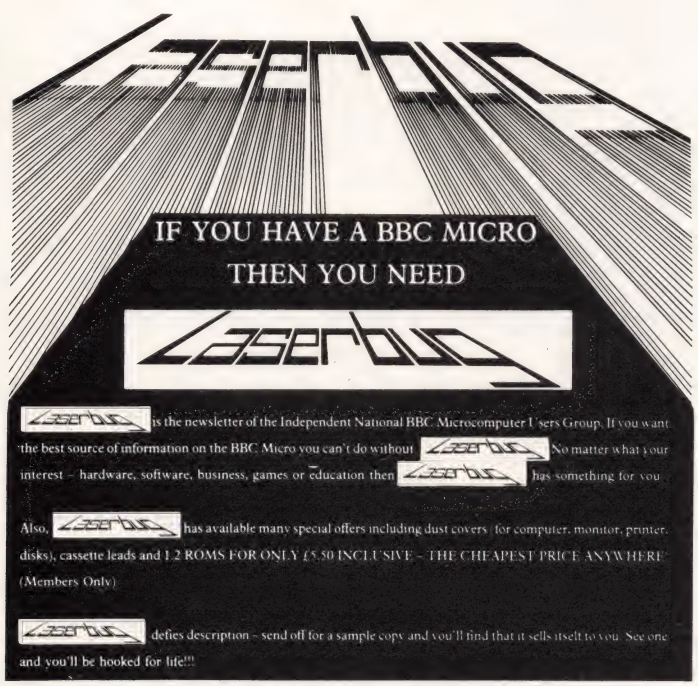

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SOFTWARE

AUTO SPRITES

The CBM 64 is renowned for its powerful Sprite Graphics. These two programs by Brian Candler demonstrates them for you.

This utility is invaluable for anyone who has tried to write 'Asteroids', real-time 'Star Trek' or any other fast-action game on the Commodore 64 using its powerful Sprite Graphics capabilities.

The problem with these games is the amount of movement needed, which tends to be slow and jerky from BASIC — and few people have the time or experience to write a machine-code routine each time. The program presented here, called "Auto-Sprites" solves these problems: it allows you to give each sprite not only an X-Y position but also an X-Y velocity. Once a sprite has been given a velocity, it will continue to move, even while the BASIC program is doing something else (like checking for collisions).

First enter the "Auto-Sprites" listing and SAVE it. Type RUN and any errors in the data will be reported, along with their line numbers. If a line turns out to be correct, check the line before it and lines 50000-50030.

When "Auto-Sprites" has been typed in correctly, you can begin to use it. The first line of your program must be GOSUB 50000, which is line 10 in the listing. If you plan to use data in your program, you must be careful — the DATA statements must come after line 60160, and you must not use RESTORE, or you will re-read the machine-code data in lines 60000-60160.

Sprite Power

Now you can use the real power of "Auto-Sprites". The command SYS M1 enables sprite movement. Hhowever, nothing will be seen to happen because the sprite velocities are initialised to zero (actually 128 — see later). You may now set the velocity of a sprite. Type:

POKE XV + (sprite number),N1
POKE YV + (sprite number),N2

Where N1 and N2 are the speeds in the X and Y directions respectively. A value of 128 represents zero speed; 255 is maximum positive speed (right or down); 0 is maximum negative speed (left or up). This may seem an odd system, but it is because POKE can only take a number in the range 0 to 255.

The actual speed of the sprite is (N-128) * 3.75 pixels per second, where N is the number which you POKEd. The speeds of all eight sprites may be set in this fashion, and they will continue to move until their speed is changed by another POKE, or RUN/STOP and RESTORE are pressed together.

This program automatically handles the Most Significant Bit of the X positions, wrap-around, and the difference between PAL and NTSC Commodore 64s.

AUTO SPRITES

One last feature it provides is automatic timeout, if the following instruction is executed:
POKE TM + (sprite number),NN

Then the specified sprite will disappear NN 60ths of a second later (NN must be in the range 1 to 255). When a sprite disappears it is still moved, though invisibly, because its enable bit in the Sprite Enable register has been set to zero.

"Auto-Sprites" makes all sorts of fast-action games, from zap-the-aliens to 'Frogger'-type games, simple, fast and effective.

For example, using the demonstration program listing, when the balloons are flying across the sky, press RUN/STOP. They will still move even if you do something else, like typing LIST. N.B. 'Auto-Sprites cannot be used with 'BC BASIC'.

HOW IT RUNS

All the BASIC program does is to load up a machine-code program from the data in lines 60000-60160 into memory, and to set up the variables as detailed. The actual sprite movement is achieved by means of the Commodore 64's 60Hz interrupt facility — every 1/60th of a second, the machine stops for an instant to scan the keyboard, update the clock etc. and 'SYS M1' calls a machine-code routine which makes the CBM 64 move its sprites at the same time. SYS M0/ calls a routine to reset the 'interrupt vector' as it is called, so that sprites are not moved.

The actual data is in 6502 machine-code and too complex to discuss here, but should be comprehensible to anyone with a thorough understanding of machine-code (and perhaps a disassembler).

Auto-Sprites may be used from machine-code; to make writing m.c. programs such simpler, simply replace the POKEs with the appropriate STA instructions. Use JSR $C0/ 30/ for SYS M1 and JSR $C0/ 3D for SYSM0/ .

HINTS ON CONVERSION

Very few machines other than the 64 have Sprite Graphics, and so the program cannot be used on very many other machines at all. However, for anyone with, say, an Atari, and who is brave enough to try to modify the program, the following locations may be useful:

D000,D002,D004...D00E	Lower 8 bits of X co-ordinate of sprites 0-7.
D001,D003,D005...D00F	Y co-ordinates of sprites 0-7.
D010	Most Significant Bit (Bit 9) of X positions.
D015	Sprite Enable register.
0314,0315	IRQ interrupt vector.

(If you are going to try to modify it — good luck!)

Variables used

Sprites are controlled and positioned as normal — to help you, "Auto-Sprites" sets up the following variables:

- V is the address of the VIC chip.
- V1 is the address of VIC plus 1 (used when setting Y positions).
- MX is the address of the most significant X-bit register.
- EN is the address of the Sprite Enable register.
- XE is the address of the X-expand register.
- YE is the address of the Y-expand register.
- SS is the address of the sprite-to-sprite collision register.
- SB is the address of the sprite-to-background collision register.
- CO is the address of the first Sprite Colour register.
- SP is the address of the first Sprite Pointer.

PROGRAM LISTING

```
10 GOSUB50000
49997 END
49998 REM ***      COMMODORE 64 AUTO-SPRITES      ***
49999 REM ***          BY BRIAN CANDLER           ***
50000 FORK=49200TO49456STEP16:S=0
50010 FORJ=KTOK+15:READA:S=S+A:POKEJ,A:NEXT
50020 READZ:IFZ<>STHENPRINT"ERROR, LINE";INT((K-49200)/16)*10+60000:END
50030 NEXTK
50040 XV=49152:YV=XV+8:TM=YV+8:V=53248:V1=V+1:MX=V+16:EN=V+21:YE=V+23
50050 XE=V+29:SS=V+30:SB=SS+1:CO=V+39:SP=2040
50060 FORK=XVTOYV+7:POKEK,128:NEXT
50070 FORK=TMTO49191:POKEK,0:NEXT
50080 POKEEN,0:M1=49200:M0=M1+13:SYSM0:RETURN
50090 REM ******************CONTROLS*******************
50100 REM * POKE XV+SPRNO.,X VELOCITY                *
50110 REM * POKE YV+SPRNO.,Y VELOCITY                *
50120 REM * POKE TM+SPRNO.,TIME LEFT ON DISPLAY      *
50130 REM * POKE CO+SPRNO.,COLOUR                    *
50140 REM * POKE SP+SPRNO.,SPRITE POINTER            *
50150 REM * V IS VIC CHIP. V1 IS VIC+1, MX IS MSB    *
50160 REM * OF X CO-ORD., EN IS ENABLE REGISTER,     *
50170 REM * XE IS X EXPAND. YE IS Y EXPAND,          *
50180 REM * SS IS SPRITE-SPRITE COLLISION REGISTER,  *
50190 REM * SB IS SPRITE-BACKGROUND COLLISION REG.   *
50200 REM * SYS M0 DISABLES AUTO-MOVEMENT           *
50210 REM * SYS M1 ENABLES AUTO-MOVEMENT            *
50220 REM ******************************************
60000 DATA 120,169,74,141,20,3,169,192,141,21,3,88,96,120,169,49,1575
60010 DATA 141,20,3,169,234,141,21,3,88,96,162,7,169,128,133,251,1766
60020 DATA 138,10,168,169,0,133,253,189,0,192,56,233,128,10,38,253,1970
60030 DATA 10,38,253,10,38,253,10,38,253,133,254,169,0,133,252,165,2009
60040 DATA 253,41,8,240,10,169,1,133,252,165,253,9,240,133,253,173,2333
60050 DATA 16,208,37,251,240,2,169,1,141,40,192,189,24,192,24,101,1827
60060 DATA 254,157,24,192,165,0,208,101,253,141,41,192,173,40,192,101,2254
60070 DATA 252,41,1,72,240,38,173,166,2,240,33,173,41,192,201,248,2113
60080 DATA 144,29,189,0,192,48,8,173,41,192,56,233,8,208,16,173,1710
60090 DATA 41,192,24,105,8,141,41,192,104,169,0,72,173,41,192,153,1648
60100 DATA 0,208,165,251,73,255,45,16,208,133,252,104,240,6,165,252,2373
60110 DATA 5,251,133,252,165,252,141,16,208,169,0,133,252,189,8,192,2366
60120 DATA 56,233,128,10,38,252,10,38,252,10,38,252,10,38,252,133,1750
60130 DATA 253,165,252,41,8,240,6,165,252,9,240,133,252,189,32,192,2429
60140 DATA 24,101,253,157,32,192,185,1,208,101,252,153,1,208,189,16,2073
60150 DATA 192,240,15,222,16,192,208,10,165,251,73,255,45,21,208,141,2254
60160 DATA 21,208,136,136,70,251,202,48,3,76,83,192,76,49,234,0,1785
READY.
```

DEMONSTRATION PROGRAM

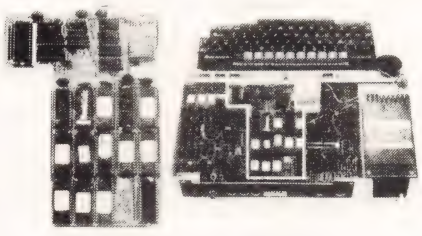
```
10 GOSUB50000:REM SET UP 'AUTO-SPRITES'
20 PRINT"□";
30 FORK=0TO7:POKESP+K,13:NEXT
40 FORK=0TO62:READZ:POKE832+K,Z:NEXT:POKEEN,255
50 FORK=0TO7:READZ:POKECO+K,Z:NEXT:POKEEN,255
60 SYSM0:FORK=0TO7:POKEXV+K,RND(1)*256:POKEYV+K,RND(1)*256:NEXT
70 POKEXE,RND(1)*256:POKEYE,RND(1)*256:SYSM1
80 FORJ=1TO5000:NEXT:GOTO60
60999 REM SPRITE DATA
61000 DATA 0,127,0,1,255,192,3,255,224,3,28,224
61010 DATA 7,107,112,7,27,240,7,107,240,3,107,96
61020 DATA 3,28,224,3,255,224,2,255,160,1,127,64
61030 DATA 1,62,64,0,156,128,0,156,128,0,73,0,0,73,0
61040 DATA 0,62,0,0,62,0,0,62,0,0,28,0
61049 REM COLOUR DATA
61050 DATA 3,4,5,8,10,12,14,15
READY.
```

Electronequip in Hampshire

Authorised BBC Dealer's Service Centre

Reference	Description (Accessories)	ExcVAT	IncVAT
BKADVANC	Advanced User Guide for the BB Micro	13.25	13.25
BKALPBBC	Assembly Language Prog for the BBC (593)	8.50	8.50
CNBPOWER	Plug for BBC Power Outlet (1-480424-0)	0.95	1.09
CNDISCPO	Power socket for Disc Drive (1-350234-9)	0.95	1.09
ACBCASEH	Hard carrying case for BBC	45.44	52.25
ACBCASES	Soft carrying case for BBC	19.00	21.85
ACBCOV1	Dust Cover for BBC (Cloth)	2.85	3.28
ACBCOV2	Dust Cover for BBC (Plastic)	4.09	4.70
ACBGPAD	Graphics Pad for BBC	71.25	81.94
ACBJOY1	Beebstick Joystick (HIGH RES)	24.70	28.41
ACBJOY2	BBC Joysticks (pair) (ANH01)	10.74	12.35
ACBPLS01	Plinth & Stowage for BBC	24.70	28.41
ACBPROG	Eprom Programmer (ATPL) (25/2716-27128)	120.00	138.00
ACBSOUNL	Sound Pick off lead for BBC Micro	6.60	7.59
ACBSPEAK	Loudspeaker in veneer case for BBC	12.83	14.75
ACBU	Plinth (U) for BBC	16.43	18.90
ACERASER	Eraser for Eprom's with timer	56.05	64.46

SIDEWISE *SIDEWISE FITTED*



Upgrades			
UGATOB	BBC Model A to Model B Upgrade (ANA11)	66.50	76.48
UGDISC	Disc Upgrade for BBC B (ANB13)	76.00	87.40
UGECONET	Econet Upgrade for BBC (ANB12)	66.50	76.48
UGSERIAL	Special Port Upgrade for BBC (RS 423)	9.50	10.93
UGSPEECH	Speech Upgrade for BBC (ANB14)	45.44	52.25
Spares			
SP1.2ROM	1.2 Operating System Rom	6.00	6.90
SP6522	6522 VIA Chip for BBC	5.22	6.00
SP8271	8271 Disc controller chip for BBC	40.00	46.00
SP2764	2764 300nS Eprom suitable for BBC	4.75	5.46

ROMs

BRASVIEW	View word processing package (SBB03)	49.40	56.81
BRCCBEEC	Beebcalc rom (spread sheet) (Com. Con.)	32.30	37.14
BRCCDISC	Computer Concepts Disc Doctor rom	26.60	30.59
BRCCTERM	Computer Concepts Term: rom (Terminal)	26.60	30.59
BRCCWORW	Wordwise Word processing ROM	33.54	38.57

Econet			
ECACLOCK	Econet System Clock (Acorn) (AEH14)	37.17	42.75
ECALEADS	Econet 10 Station lead set (Acorn) AEH18	23.96	27.55
ECATERM	Econet Terminator (Acorn) (AEH15)	28.91	33.24
ECCABLE1	Econet cable 1M	0.82	0.94
ECFILES1	Econet File server level 1 (AES20)	81.79	94.05
ECFILES2	Econet File server level 2 (AES21)	205.69	236.55
ECPRINTR	Print server Rom (AES22)	40.48	46.55
ECSJCLOC	Econet Clock & Terminators (SJ)	71.25	81.94

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Reference	Description (BBC Micros)	ExcVAT	IncVAT
ANA01	BBC Model A Micro Computer	261.30	299.00
ANA02	BBC Model A with Econet Interface	310.86	356.00
ANA32	BBC Model A Micro with 32K	291.30	333.50
ANA33	BBC Model A Micro with 32K and VIA	296.52	339.50
ANB01	BBC Model B Micro Computer	343.05	393.02
ANB02	BBC Model B with Econet Interface	383.30	439.31
ANB03	BBC Model B with Disc Interface	403.00	461.97
ANB04	BBC Model B with Disc & Econet Interface	443.26	508.26
SYBWP1	BBC Wordprocessor View Disc Daisy Print.	1092.50	1256.38

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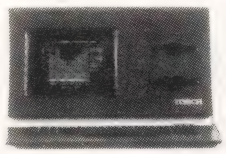

DDTZ80DP	Torch Z80 Disc Pack (800K Dual + Z80)	741.00	852.15
CF240	Torch Computer twin floppies (CF240)	2655.25	3053.45
CF240/10	Torch Computer 10Mb Winchester CF240/10	4745.25	5457.04
CF240/21	Torch Computer 21Mb Winchester CF240/21	5220.25	6003.29
TZ80P	Torch Z80 Second Processor for BBC	213.75	245.81
TCBBCBAS	Torch CPN BBC Basic (Z80)	104.50	120.18
TCMULTIP	Torch CNP Multiplan (Spread sheet)	179.55	206.48
TCPERSOF	Torch CPN Perfect Software Set	285.00	327.75
TCPLANC	Torch CPN Plannercalc (spreadsheet)	80.75	92.86
TCPPFORT	Torch CPN Prospero Fortran	209.00	240.35
TCPPPASC	Torch CPN Prospero Pascal V2.1	209.00	240.35
TCWORDST	Torch CP/N Wordstar Wordprocessing	261.25	300.44

Acorn Atom			
AA1e+12	Acorn Atom Micro 12K ram 12Krom	82.56	94.95
AA8e5COL	Acorn Atom 8Kram 5Krom Colour + Games Ca	82.56	94.95
ARASFLPT	Floating Point Rom for Acorn Atom	19.00	21.85
ARPPTOOL	(Programmers) Tool Box Rom for Atom	20.00	23.00
DDAACORN	Acorn Atom Disc Drive 100k 40T	284.05	326.66

Access & Barclay card welcome (Large discounts for educational orders). Trade enquiries welcome
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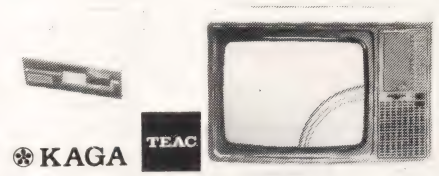
Reference	Description (Cassette Recorders)	ExcVAT	IncVAT
CAC10	C10 Data Cassette tape	0.46	0.52
CAC15	C15 Data Cassette tape	0.49	0.57
CAC5	C5 Data Cassette tape	0.41	0.48
CACASE	Cassette Case (only)	0.10	0.11
CRANF03	BBC Data (cassette) Recorder (ANF03)	26.00	29.90
CRDATEX	Datex Computer Cassette Recorder (DX/3)	24.70	28.41
CRSDR	Data Recorder (Sanyo DR101)	34.74	39.95

Wordprocessing system on BBC Micro with Daisy Wheel Printer and disc drive. Cost 1092.50 + VAT ref. SYBWP1

Disc Drives etc			
DDAND01	BBC 100K Single Disc Drive (AND01)	218.91	251.74
DDAND02	BBC 800K Dual Disc Drive (AND02)	664.05	763.66
DDT100SA	Teac 100K Single 40T Disc Drive for BBC	174.80	201.02
DDT200DA	Teach 200K Dual 40T Disc Drive for BBC	344.85	396.58
DDT200SE	Teac 200K Single 80T Disc Drive for BBC	222.30	255.65
DDT400DE	Teac 400K Dual 80T Disc Drive for BBC	439.85	505.83
DDT400SF	Teac 400K Single 80T Disc Drive for BBC	288.80	332.12
DDT800DF	Teac 800K Dual 80T Disc Drive for BBC	572.85	658.78
DSD40S	5.25" Datalifc 40T Single-sided disc	1.90	2.19
DSM80D	5.25" Memorex 80T Double-sided disc	2.47	2.84



Monitors			
MNK12A	Kaga K12A 12" Orange Monitor	107.35	123.45
MNK12B	Kaga 12" 09 Black/White Monitor	94.05	108.16
MNK12G	Kaga K12G 12" Green Monitor	94.05	108.16
MNKVIS2	Kaga 12" RGB Monitor Vision II (Medium)	270.75	311.36
MNKVIS3	Kage 12" RGB Monitor Vision III (Hi)	379.05	435.91
MNM1431	BBC 14" Colour Monitor (Microvitec 1431)	237.50	273.13
MNM1441	Microvitec 1441 High Res 14" BBC Monitor	474.05	545.16
MNM1451	Microvitec 1451 Medium Res 14"	355.30	408.60
MNN 1434	14" TV Monitor Nordmende	214.70	246.90
MNN3434	14" TV/Monitor Normende with remote cont	224.10	257.72
MNSM12N	Snayo SM12N Green Monitor 15MHz	75.05	86.31

EPSON RX-80 & FX-80

Printers			
PAETRACT	Tractor unit for Epson FX-80	34.20	39.33
PPFF1K	1000 Sheets fan-fold tractor feed paper	6.19	7.12
PPROLLTR	Roll paper for Sparkjet/Epson (TR-1)	1.70	1.96
PRCP80	Film Ribbon for CP-80 printer	4.75	5.46
PRE80	Ribbon for Epson MX/FX/RX 80	5.70	6.55
PRJP101	Inkjets for JP101 (pack of 4)	5.70	6.55
PRMX100R	Ribbon refill for Epson MX/FX 100	4.37	5.03
PRTP1200	Fabric Ribbon for Smiths Corona TP-1	2.85	3.28
PRTP1220	Film Ribbon for Smiths Corona TP-1	2.85	3.28
PTCP80	CP-80 80cps Printer (MX-80 type III)	284.05	326.66
PTFX80	Epson FX80 160cps Printer	365.09	419.85
PTFX100	Epson FX100 160cps Printer	493.05	567.01
PTJ6100	Junki 6100 Daisy Wheel Printer 18cps	365.09	41985
PTJP101	BBC Spark-Jet Printer	284.05	326.66
PTMX100	Epson MX?? Type 3 Printer	422.75	486.16
PTMX80	Epson MX-80 80cps Dot matrix printer	350.55	403.13
PTRX80	Epson RX-80 Printer 100cps	257.00	295.55
PTRX80FT	Epson RX-80FT Printer 100cps (T/Fric)	280.25	322.29
PTT1040	TEC F10-40 40cps Daisy Wheel Printer	1220.75	1403.86
PTTCOLR	Torch Colour Printer	1472.50	1693.38

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sinclair special 5

Inside... New Interface 2 and ROM cartridges! New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX® assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2® and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX® Computers

Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

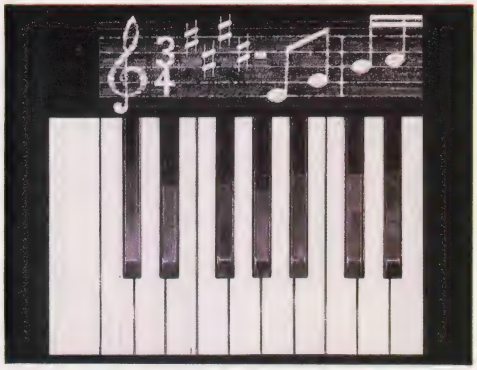
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.®

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.



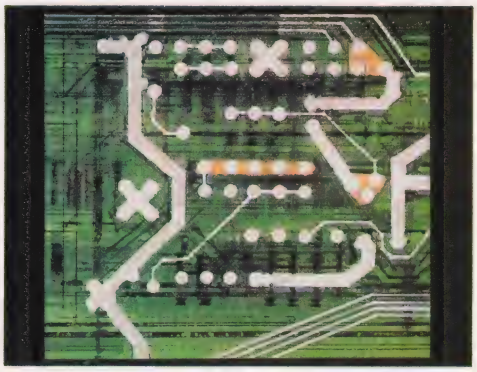
Musicmaster

For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.



Make-a-Chip

For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

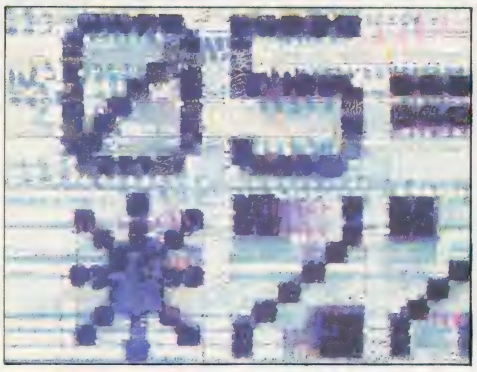
Make-a-Chip is a fascinating way of finding out how computer logic works.

Print Utilities

For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC

For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2®

The New ROM Cartridge/Joystick Interface

Loads programs instantly!
Takes two joysticks!
Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!

SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

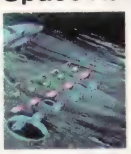
And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon

Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

New! PSSST

Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess

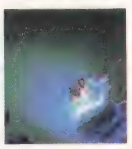
This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace

Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am

Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders

Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

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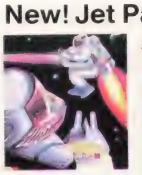

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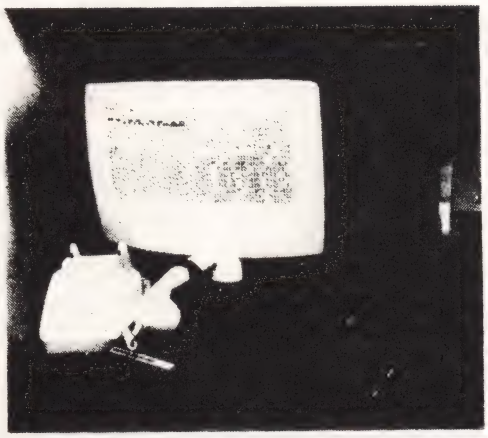

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ATARI DISASSEMBLER

Disassemble your machine with this utility by F.M. O'Dwyer.

This is a program for a disassembler utility which uses approximately 5K of RAM.

Using the program

When you RUN the program you should get the prompt STARTING ADDRESS? Enter the address from which disassembly is to start in decimal or hexadecimal. Precede a hexadecimal address with a dollar sign and use no spaces.

Now you should see PAGING (Y/N)? If you answer Y followed by return, the disassembly will stop each time the screen is about to fill. To resume press the space bar. To QUIT disassembly press Q and this will return you to the STARTING ADDRESS? prompt at any point during the disassembly.

The program prompts OUTPUT DEVICE? next and you should answer with a device specification such as S or S: to list to the screen. If you specify another device such as printer, disc or cassette, then output is initially to the screen but is followed by output to the specific device. To close the file and restore the device, press Q.

Variables used:

TABLEs: A string of length 1024 bytes. Four bytes are held for each possible opcode (0-255), three bytes for the assembler instruction (e.g. BNE) and one byte for the addressing mode. The 13 addressing modes are given code numbers 0-12 as shown in table 1. If an opcode doesn't exist in the instruction set, it is given the mnemonic. This method of holding the data may seem extravagant, but it is very efficient in terms of speed.

BYTEs: A string containing the information about each addressing mode.

As,Hs: General purpose strings

M: current addressing mode

B: no. of bytes in operand

AD: address in memory

DEV: = 1 if second output device in use

PAGE: = 1 if output is to be paged

LI: running count of lines output to screen

HOW IT RUNS

Lines 180-240	Initialisation
Lines 250-360	Input options
Lines 370-770	Major loop. Disassemble one instruction.
Lines 780-830	Subroutine to output a hexadecimal byte
Lines 840-870	Page subroutine. Wait for space bar.
Lines 880-1730	Data for TABLEs. Data is held in the following format:

(1) If the instruction exists, the mnemonic followed by the addressing mode, e.g. DATA BNE,10
2) If the instruction doesn't exist, a null string. Null strings occur between adjacent commas, after a comma at the end of a line, or before a comma at the beginning of a line.

DEBUGGING

If the disassembler seems to disassemble wrongly proceed as follows:

1) Check the area in memory that you are disassembling. If it changes rapidly (e.g. a hardware register or an interrupt driven counter or basic register) then it may have changed its value during disassembly, hence the error.
2) If you are sure that the memory is not at fault (e.g. it is ROM) then check the offending opcode against the data statements in the program, as follows: (e.g. opcode 00 is wrongly disassembled as TXA, say)

a) Find the DATA statement for opcode 00 using the REM statements above each one. Line 880 says that the next line has opcodes 00-05, so 890 contains opcode 00. Find opcode 00 in line 890 by counting data items from

the left (a data item is a pair, e.g. BNE,10, or a null, e.g. ,,). In line 890 opcode 00 is the first data item, BRK,0 which we have wrongly typed as TXA,0 , so all that remains is to alter that data item and the fault should disappear. The same approach can be used to change the mnemonic set to other processors of the R65 variety.

b) If the fault is not in the DATA then check the body of the program.

TABLE 1 Addressing Modes

CODE	NAME	EXAMPLE
0	Implied	TXA
1	Accumulator	ROL A
2	Absolute	LDA D000
3	Zero Page	LDA 01
4	Immediate	LDA 01
5	Indexed X	LDA D000,X
6	Indexed Y	LDA D000,Y
7	Indexed Indirect	LDA (00,x)
8	Indirect Indexed	LDA (00),Y
9	Z-page Indexed X	LDA 00,X
10	Relative	BMI D000
11	Indirect	JMP (D000)
12	Z-page Indexed Y	LDA 00,Y

HINTS ON CONVERSION

The program is useful for all 6502-based machines. The main peculiarities are in string handing and device handling. The DIM statement isn't required on most basics, and lines such as TABLEs(LEN(TABLEs) + 1) = As translate as TABLEs = TABLEs + As. As(n,n) returns the Nth character in As, and As(n) returns the substring beginning with the Nth character.

The statements referring to devices and streams may be altered to suit other micros, or simply left out. TRAP lineno is the name as ON ERROR GOTO lineno. GRAPHICS 0 clears the screen. The POKEs to location 764 deal with the keyboard. (764) = 255 if no key has been pressed, 47 if Q has been pressed, and 33 if space has been pressed. POKE 764,255 clears the key.

PROGRAM LISTING

```
100 REM ******************************
110 REM *                            *
120 REM *        DISASSEMBER         *
130 REM *                            *
140 REM *      By Frank O'Dwyer      *
150 REM *                            *
160 REM ******************************
170 REM
180 DIM TABLE$(1024),A$(20),BYTE$(13),H$
(1)
190 TRAP 200:LPRINT :REM CLEAR CASSETTE
BUFFER
200 TABLE$="":RESTORE :GRAPHICS 0:PRINT
"SETTING UP TABLE...";
210 FOR N=0 TO 255:READ A$
220 IF A$="" THEN TABLE$(LEN(TABLE$)+1)=
"???":TABLE$(LEN(TABLE$)+1)=CHR$(0)
230 IF A$<>"" THEN TABLE$(LEN(TABLE$)+1)
=A$:READ A:TABLE$(LEN(TABLE$)+1)=CHR$(A)
240 NEXT N:BYTE$="":FOR N=0 TO 12:READ A
:BYTE$(LEN(BYTE$)+1)=CHR$(A):NEXT N:PRIN
T "O.K. READY"
250 TRAP 250:PRINT :PRINT "START ADDRESS
 ";:INPUT A$:IF A$="EXIT" OR A$="X" THEN
 TRAP 40000:END
260 IF A$="" OR A$="$" THEN 250
270 IF A$(1,1)<>"$" THEN AD=INT(ABS(VAL(
A$))):GOTO 320
280 AD=0:FOR N=2 TO LEN(A$):IF A$(N,N)>=
"0" AND A$(N,N)<="9" THEN AD=16*AD+VAL(A
$(N,N)):GOTO 310
290 IF A$(N,N)>="A" AND A$(N,N)<="F" THE
N AD=16*AD+ASC(A$(N))-ASC("A")+10:GOTO 3
10
300 GOTO 250
310 NEXT N
320 PRINT :PRINT "PAGING (Y/N) ";:INPUT
H$:IF H$<>"Y" AND H$<>"N" THEN 320
330 PAGE=0:IF H$="Y" THEN PAGE=1
340 PRINT :PRINT "OUTPUT DEVICE ";:INPUT
 A$:DEV=1:IF A$="E:" OR A$="S:" OR A$="E
" OR A$="S" THEN DEV=0:GOTO 360
350 TRAP 340:CLOSE #1:OPEN #1,8,0,A$:TRA
P 250
360 POKE 764,255:LI=-1:GRAPHICS 0:POKE 7
52,1
370 LI=LI+1:IF AD>65535 THEN AD=0
380 IF PAGE AND LI=23 THEN GOSUB 840
390 IF PEEK(764)=47 THEN GRAPHICS 0:POKE
 764,255:CLOSE #1:GOTO 250
400 A=PEEK(AD)+1:A$=TABLE$(A*4-3,A*4)
410 M=ASC(A$(4)):B=ASC(BYTE$(M+1))
420 FOR I=0 TO B:P=PEEK(AD+I):GOSUB 780:
NEXT I
430 FOR I=1 TO 6-2*B:PRINT " ";:IF DEV T
HEN PRINT #1;" ";
440 NEXT I
450 P=INT(AD/256):GOSUB 780:P=AD-256*P:G
OSUB 780:PRINT "  ";:IF DEV THEN PRINT #
1;"  ";
460 PRINT A$(1,3);" ";:IF DEV THEN PRINT
 #1;A$(1,3);" ";
470 AD=AD+1
480 IF B<>0 THEN 530
490 IF M=1 THEN PRINT "A":IF DEV THEN PR
INT #1;"A"
500 IF M=1 THEN 370
510 PRINT :IF DEV THEN PRINT #1
520 GOTO 370
530 AD=AD+1:IF M=7 OR M=8 THEN 660
540 IF B<>1 THEN 650
550 IF M=4 THEN PRINT "#";:IF DEV THEN P
RINT #1;"#";
560 PRINT "$";:IF DEV THEN PRINT #1;"$";
570 IF M<>10 THEN 610
580 D=PEEK(AD-1):IF D>127 THEN D=-(256-D
)
590 DE=AD+D:P=INT(DE/256)
600 GOSUB 780:P=DE-P*256:GOSUB 780:GOTO
630
610 P=PEEK(AD-1):GOSUB 780:IF M=9 THEN P
```

ATARI DISASSEMBLER

```
RINT ",X";:IF DEV THEN PRINT #1;",X";
620 IF M=12 THEN PRINT ",Y";:IF DEV THEN
 PRINT #1;",Y";
630 PRINT :IF DEV THEN PRINT #1
640 GOTO 370
650 AD=AD+1
660 IF M=7 OR M=8 OR M=11 THEN PRINT "("
;:IF DEV THEN PRINT #1;"(";
670 P=PEEK(AD-1):PRINT "$";:IF DEV THEN
PRINT #1;"$";
680 GOSUB 780:IF M=2 OR M=5 OR M=6 OR M=
11 THEN P=PEEK(AD-2):GOSUB 780
690 IF M=5 THEN PRINT ",X";:IF DEV THEN
PRINT #1;",X";
700 IF M=6 THEN PRINT ",Y";:IF DEV THEN
PRINT #1;",Y";
710 IF M=7 OR M=8 OR M=11 THEN 740
720 PRINT :IF DEV THEN PRINT #1
730 GOTO 370
740 IF M=7 THEN PRINT ",X)":IF DEV THEN
PRINT #1;",X)"
750 IF M=8 THEN PRINT "),Y":IF DEV THEN
PRINT #1;"),Y"
760 IF M=11 THEN PRINT ")":IF DEV THEN P
RINT #1;")"
770 GOTO 370
780 W=INT(P/16):Q=P-W*16
790 S=W:GOSUB 800:S=Q:GOSUB 800:RETURN
800 IF S>=0 AND S<=9 THEN H$=STR$(S):PRI
NT H$;:IF DEV THEN PRINT #1;H$;
810 IF S>=0 AND S<=9 THEN RETURN
820 H$=CHR$(65+S-10):PRINT H$;:IF DEV TH
EN PRINT #1;H$;
830 RETURN
840 POKE 764,255
850 IF PEEK(764)<>33 AND PEEK(764)<>47 T
HEN 850
860 LI=0:IF PEEK(764)=47 THEN RETURN
870 POKE 764,255:RETURN
880 REM 00-05
890 DATA BRK,0,ORA,7,,,,ORA,3
900 REM 06-0A
910 DATA ASL,3,,PHP,0,ORA,4,ASL,1
920 REM 0B-10
930 DATA ,,ORA,2,ASL,2,,BPL,10
940 REM 11-17
950 DATA ORA,8,,,,ORA,9,ASL,9,
960 REM 18-1D
970 DATA CLC,0,ORA,6,,,,ORA,5
980 REM 1E-23
990 DATA ASL,5,,JSR,2,AND,7,,
1000 REM 24-28
1010 DATA BIT,3,AND,3,ROL,3,,PLP,0
1020 REM 29-2D
1030 DATA AND,4,ROL,1,,BIT,2,AND,2
1040 REM 2E-33
1050 DATA ROL,2,,BMI,10,AND,8,,
1060 REM 34-38
1070 DATA ,AND,9,ROL,9,,SEC,0
1080 REM 39-3F
1090 DATA AND,6,,,,AND,5,ROL,5,
1100 REM 40-45
1110 DATA RTI,0,EOR,7,,,,EOR,3
1120 REM 46-4A
1130 DATA LSR,3,,PHA,0,EOR,4,LSR,1
1140 REM 4B-50
1150 DATA ,JMP,2,EOR,2,LSR,2,,BVC,10
1160 REM 51-57
1170 DATA EOR,8,,,,EOR,9,LSR,9,
1180 REM 58-5E
1190 DATA CLI,0,EOR,6,,,,EOR,5,LSR,5
1200 REM 5F-65
1210 DATA ,RTS,0,ADC,7,,,,ADC,3
1220 REM 66-6A
1230 DATA ROR,3,,PLA,0,ADC,4,ROR,1
1240 REM 6B-6F
1250 DATA ,JMP,11,ADC,2,ROR,2,
1260 REM 70-75
1270 DATA BVS,10,ADC,8,,,,ADC,9
1280 REM 76-7B
1290 DATA ROR,9,,SEI,0,ADC,6,,
1300 REM 7C-82
1310 DATA ,ADC,5,ROR,5,,,STA,7,
1320 REM 83-88
1330 DATA ,STY,3,STA,3,STX,3,,DEY,0
1340 REM 89-8E
1350 DATA ,TXA,0,,STY,2,STA,2,STX,2
1360 REM 8F-94
1370 DATA ,BCC,10,STA,8,,,STY,9
1380 REM 95-99
1390 DATA STA,9,STX,12,,TYA,0,STA,6
1400 REM 9A-A0
1410 DATA TXS,0,,,STA,5,,,LDY,4
1420 REM A1-A5
1430 DATA LDA,7,LDX,4,,LDY,3,LDA,3
1440 REM A6-AA
1450 DATA LDX,3,,TAY,0,LDA,4,TAX,0
1460 REM AB-B0
1470 DATA ,LDY,2,LDA,2,LDX,2,,BCS,10
1480 REM B1-B6
1490 DATA LDA,8,,,LDY,9,LDA,9,LDX,12
1500 REM B7-BC
1510 DATA ,CLV,0,LDA,6,TSX,0,,LDY,5
1520 REM BD-C3
1530 DATA LDA,5,,,CPY,4,CMP,7,,
1540 REM C4-C8
1550 DATA CPY,3,CMP,3,DEC,3,,INY,0
1560 REM C9-CD
1570 DATA CMP,4,DEX,0,,CPY,2,CMP,2
1580 REM CE-D3
1590 DATA DEC,2,,BNE,10,CMP,8,,
1600 REM D4-D9
1610 DATA ,CMP,9,DEC,9,,CLD,0,CMP,6
1620 REM DA-E0
1630 DATA ,,,CMP,5,DEC,5,,CPX,4
1640 REM E1-E7
1650 DATA SBC,7,,,CPX,3,SBC,3,INC,3,
1660 REM E8-EC
1670 DATA INX,0,SBC,4,NOP,0,,CPX,2
1680 REM ED-F2
1690 DATA SBC,2,INC,2,,BEQ,10,SBC,8,
1700 REM F3-F9
1710 DATA ,,SBC,9,INC,9,,SED,0,SBC,6
1720 REM FA-FF
1730 DATA ,,,SBC,5,INC,5,
1740 REM BYTES PER MODE
1750 DATA 0,0,2,1,1,2,2,1,1,1,1,2,1
```

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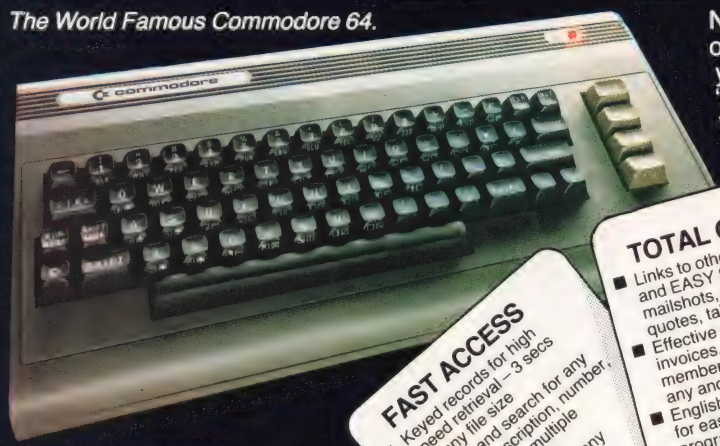

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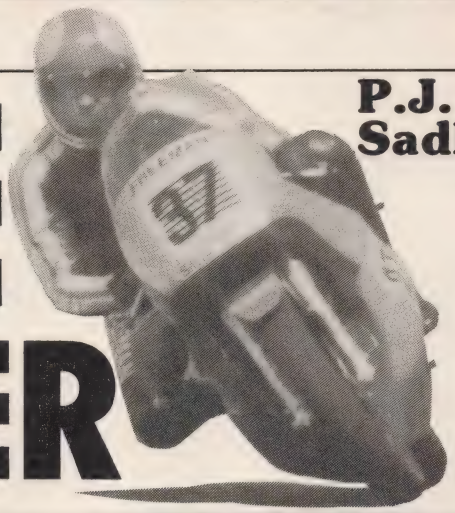
SOFTWARE

DOUBLE SPEED SAVER



P.J. Sadler

The Atoms' cassette operating system, whilst being flexible and versatile can save and load files only at the reasonably modest rate of 300 Baud. Hence there are fast cassette operating systems available from many of the interested software houses. Feeling unwilling to pay for the faster systems, I loaded my disassembler and set about unravelling the resident system, preliminary to writing my own. After some hours I had finally analysed the routines and subroutines in sufficient detail to set about the task. The listed program came from that analysis, which revealed that with a few cunning POKES, a doubling of the speed of the byte read and write subroutines could be achieved.

Background Details

The system, as the handbook indicates, uses eight cycles of a 2400 Hz tone to represent a logic 1, and four cycles of a 1200 Hz tone for a logic 0. On inspection of the byteput routine, which starts at # FC7C, it can be seen that one cycle of a 1200 Hz tone is achieved by setting bit 2, and vibrating bit 0 of # B002, producing a pulse to the cassette tape. In the ROM, the start of the routine that does this is at # FC9C, and it uses a subroutine at # FCD8 to give the correct interval between pulses. The four cycles are counted in the Y register which is set with an immediate LDY instruction at # FC9C. So if address # FC9D could be set to hold 2 instead of 4, then two cycles only would be produced. The same approach can be made with the 2400 Hz tone of which eight cycles are counted off in the X-register, again by the subroutine at # FCD8, but this time entering at # FCDA, with the X-register set before the call in an immediate LDX instruction at # FC92. So setting address # FC93 to hold 3 would produce four instead of eight cycles of 2400 Hz tone.

Change Around

Changes must now be made to the byteget routine to recognise the shorter form. The routine resides at # FBEE, and uses a subroutine at # FCBD to recognise the incoming tones and count their cycles. If judicious changes were made to bytes at # FBF5, # FCO2 and # FC17, the routine would recognise the double speed byte.

Of course with the routines residing in ROM the above changes can't be made. They must first be relocated to RAM and the changes made there. The program therefore requires not only space for itself, but also a further 260 bytes for the relocated routines. The program itself is only 210 bytes long, and the relocated code consumes 204 bytes, small enough to fit into the space between # 2800 and # 2900. One side effect of the changes is that the routine producing logic 1 unsets bit 2 of # BOO2, and logic 0 sets bit 2 which produces an audible noise on the Atoms' speaker during the save operation; this is cosmetically undesirable, though it is novel to hear your file being loaded, indeed if the relocation area chosen is in the upper text space then you get not only audible SAVE, but visible SAVE and LOAD.

All of the existing facilities are unaffected, including the sum error checking, and I found that no adjustments were required to the volume or tone controls of my tape recorder.

So here is the listing, using ATOMBASIC abbreviated form to save space:

HOW IT RUNS

Line 10	Requests relocation address from user and assigns to variables P and Q.
Lines 20 and 30	Loop to transfer code from ROM into relocation area.
Lines 40 and 100	Point BPUT and BGET vectors to relocated code
Line 50	Modify BPUT routine
Line 60	Modify BGET routine.

Enter the program and save it to cassette using *SAVE"FASTCOS"SSSS EEEE and you can then *LOAD the program to any area of free memory whenever the faster system is required. Using the faster system is then exactly the same as with the original system.

PROGRAM LISTING

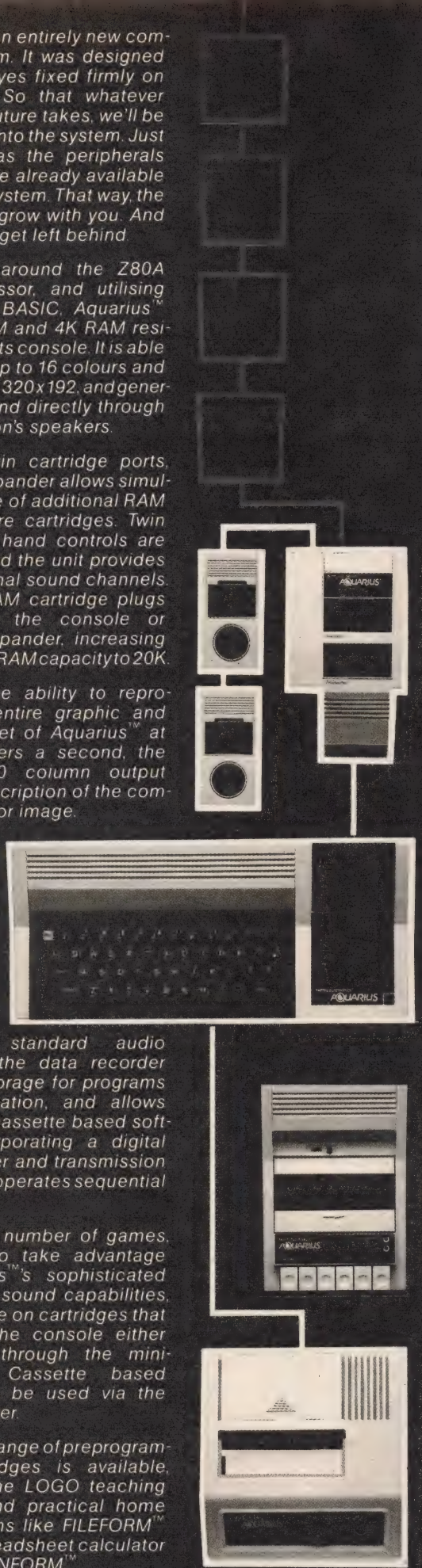
```
10 IN."SPECIFY RELOCATION ADDRESS"P;Q = P
20 F.I = OTO206 S.4
30 I!P + I!#FBEE;N.
40 I = #214; GOS.p;P = P + 142;I = # 216;GOS.p
50 ?(Q + # A5) = 3;?(Q + # AF) = 2
60 ?(Q + 7) = 124;?(Q + # 14) = 42;?(Q + # 29) = 6;END
100 p ?I = P;I?1 = P&  FFFF/256;R.
```

● *This is an entirely new computer system. It was designed with both eyes fixed firmly on the future. So that whatever shape the future takes, we'll be able to fit it into the system. Just as simply as the peripherals and software already available fit into the system. That way, the system will grow with you. And you'll never get left behind.*

● *Based around the Z80A microprocessor, and utilising Microsoft™ BASIC, Aquarius™ has 8K ROM and 4K RAM resident within its console. It is able to provide up to 16 colours and resolution of 320x192, and generates its sound directly through the television's speakers.*

● *With twin cartridge ports, the mini-expander allows simultaneous use of additional RAM and software cartridges. Twin disc game hand controls are included and the unit provides two additional sound channels. The 16K RAM cartridge plugs into either the console or the mini-expander, increasing Aquarius™'s RAM capacity to 20K.*

● *With the ability to reproduce the entire graphic and character set of Aquarius™ at 80 characters a second, the printer's 40 column output allows transcription of the complete monitor image.*



Using standard audio cassettes, the data recorder provides storage for programs and information, and allows the use of cassette based software. Incorporating a digital tape counter and transmission indicator, it operates sequential searching.

● *A large number of games, designed to take advantage of Aquarius™'s sophisticated colour and sound capabilities, are available on cartridges that plug into the console either direct, or through the mini-expander. Cassette based games can be used via the data-recorder.*

A wide range of preprogrammed cartridges is available, including the LOGO teaching program and practical home data systems like FILEFORM™ and the spreadsheet calculator package, FINFORM.™

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COMPUTER CAMPS

Last summer 'Computer Camps' sprang up all over the country. Jane Price visited one of the Inter-Action Trust schemes in Inner London

Community Computer Camps are one of the best ways of keeping kids usefully occupied during the summer holidays to have emerged in recent years.

Thousands of British youngsters this summer at last had the chance to take advantage of one of the 40 one week non-residential courses running from July to September. Not only do the children learn something useful they also have tremendous fun doing so.

Open to children between the ages of 9-16 the courses' aim is to introduce them to the world of computing and educate them in basic programming techniques.

I visited the Kentish Town Computer Camp towards the end of their summer run and found happy, chattering groups of youngsters clustered round Atari computers, busily devising games and graphics programs. They were obviously enjoying themselves while learning and the 'school atmosphere' was distinctly absent. Friendly, informal instructors were constantly on hand to encourage and give advice while quite advanced projects were being

attempted by the children themselves. The more experienced students had fun helping others with their programming problems. David O'Keefe, a 13 year old from central London, was vehement in his praise of the course. Although he has an Apple II at home, he didn't know the first thing about it until he went along to the camp and was introduced to computers and programming by their simple informative approach. Halfway through his week's course, he was confident in using the Atari and had begun to write his own game called Aliens. David really enjoyed the course and is hoping to repeat it next year — he now plans a career in computing!

Children with more advanced knowledge of computing skip the introductory course and move 'up' to the Polytechnic in Kentish Town, where on BBC computers they learn more of the intricacies of programming in BASIC and FORTH.

The camps, organised by local community action groups, were initiated by the Inter-Action Trust, a London-based charity, in association with Atari International (UK). The national programme of these summer schools was developed from an original idea of the Inter-Action Trust, who realised the need for children, particularly those from less-privileged backgrounds, to see, touch and gain a basic understanding of what computers are capable of achieving and their applications in today's world. The Trust hoped especially to reach those children who might otherwise have no direct contact with computers.

Origins

The Trust have been operating a Computer Consultancy service for several years, advising other charitable and social service departments on the best system for their needs and are therefore well-qualified for running the Computer Camps. They saw a waste of resources occurring through the long summer holidays, when computers lay unused in dusty classrooms. Student Computer Scientists, teachers and specialists with time on their hands were approached and with the help of local authority grants and loans of computers through Atari, the Camps took off, the first one taking place at Inter-Action Group's headquarters in Kentish Town in the summer of '82.

Children program the robot arm to comb hair at an Inter-Action Community Computer Camp. The camps are sponsored by Atari and the robot arm is loaned free by Cyber Robotics.

This year, Molly Lowell, the co-founder and field co-ordinator for Community Computer Camps, channelled her energy into getting funding and sponsorship for a whole network of camps around Inner London and the rest of Britain. During the week's course, the children received expert tuition in basic programming techniques and considerable 'hands on' experience, with one Atari 800 home computer for every two students. All the children benefitted in gaining an insight into how computers can best further their education and employment prospects.

These camps are only possible through the generosity of companies such as Atari International, who this year loaned all the computers and software, and of the teachers who often work on a voluntary basis. Molly Lowell has worked out a cost effective system for the Camps. Groups can set up six one-week Camps for 216 young people with a Local Authority Grant of between £1300 and £2700, providing the premises are available free. The funding is needed for leaflets and staff, including the tutors, unless they will come as volunteers. If disadvantaged young people at £5 per week are combined with those paying £25 per week, the amount of grant aid needed can drop to £1300 or less. The fees paid by the children include the cost of daily lunches.

The Camps in Inner London, were once again this year oversubscribed and the Trust find it a very difficult job deciding on which youngsters to take. As I have said, because the Trust is a charitable organisation, their selection procedure is biased toward the less privileged, but should some enterprising group decide to set up a Camp along similar lines, charging a reasonable fee to cover all costs, there is no reason why any youngster should be kept away. A comparison of such a Camp's costs with those of the commercial 'computer summer schools' shows the tremendous savings to be made by self organisation, perhaps involving schools, teachers and parents in the long summer break. Something to think about for next summer maybe? Anyone interested in finding out more about the Camps and how to organise one should contact Molly Lowell on 01-267 9421 for information and a fact sheet.

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```
  1 REM ************************
  2 REM *        BOMBER        *
  3 REM *   By RICHARD TAYLOR  *
  4 REM * © CRL September '83 *
  5 REM ************************
  6 REM
 10 RANDOMIZE 1000
 20 RANDOMIZE USR 61030
 30 RANDOMIZE : BORDER 6
 40 OVER 0: INVERSE 0: FLASH 0
 50 BRIGHT 0: INK 0: PAPER 7
 60 CLS
 70 GO SUB 9000
 80 GO SUB 8000
 90 LET Hi=0: LET z=1: LET Scor
e=0
100 CLS : PRINT "  HI:";Hi;TAB
20;"SCORE:";Score
110 PLOT 0,163: DRAW 255,0
120 LET a=4000: REM LIMIT a
130 LET a=6000: REM INTERACT a
140 GO SUB 3000
150 LET x=0: LET y=50: REM MOVE
 Plane,x,y
160 LET x=255: LET a=30: REM MO
VE Enemy,x,a
170 GO SUB 2000: GO TO 170
1000 LET a=0: LET b=176
1010 REM MOVE Plane,a,b\ENABLE P
lane
1020 REM ALL Bomb\MOVE Bomb,a,b
1030 REM ENABLE Bomb
1040 REM MOVE Enemy,a,b\ENABLE E
nemy
1050 CLS
1060 FOR a=0 TO 7
1070 PRINT PAPER a;: REM FILL
1080 BEEP .1,a*5: NEXT a
1090 PAUSE 25: FOR a=60 TO 0 STE
P -1: BEEP .005,a: NEXT a
1100 FOR c=0 TO 1000 STEP 20
1110 LET a=10: LET b=3: LET d=50
1120 REM SOUND a,b,c,d
1130 NEXT c
1140 LET a$="SCORE:"+STR$ Score
1150 LET x=0: LET y=50: LET t=2:
 LET w=3
1160 REM TEMPS\LARGE
1170 IF Hi>Score THEN GO TO 1200
1180 LET Hi=Score: LET a$="A New
 HIGH SCORE"
1190 LET x=60: LET y=100: LET t=
2: LET w=1: PRINT INK 1;: REM LA
RGE
1200 PRINT #0; FLASH 1;"       A
 New Level? (y/n)
1210 IF INKEY$<>"" THEN GO TO 12
10
1220 IF INKEY$="n" OR INKEY$="N"
 THEN GO TO 1500
1230 IF INKEY$<>"y" AND INKEY$<>
"Y" THEN GO TO 1220
1240 INPUT "New Level? ";Level
1250 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 1240
1260 GO TO 90
1500 INPUT INKEY$: PRINT #0; FLA
SH 1;"          Another Game? (y/n)
"
1510 IF INKEY$<>"" THEN GO TO 15
10
1520 IF INKEY$="y" OR INKEY$="Y"
 THEN LET Score=0: LET z=1: GO T
O 100
1530 IF INKEY$<>"n" AND INKEY$<>
"N" THEN GO TO 1520
1540 LET a$="OK": LET w=16: LET
t=22
1550 CLS
1560 LET x=0: LET y=0: REM TEMPS
\LARGE
1570 LET a=21: LET b=31: REM GET
 x,y,a,b,a$
1580 FOR a=0 TO 21: LET b=a*.687
5
1590 REM PUT a,b,a$
1600 PAUSE 5: NEXT a
1610 LET a=INT (RND*8): PAPER a:
 BORDER a: CLS : BEEP 1,-10
1620 GO TO 1610
2000 LET a$=INKEY$: IF a$<>"" THE
N RETURN
2010 IF a$="6" THEN LET y=y+1+(L
evel<2): LET Score=Score-2
2020 IF a$="7" THEN LET y=y-1-(L
evel<2): LET Score=Score-10
2025 PRINT AT 0,26;Score;"  "
2030 IF y<20 THEN LET y=20
2032 IF y>168 THEN LET y=168
2035 REM MOVE Plane,COLUMN Plane
,y
2040 IF a$<>"0" THEN RETURN
2050 REM USE Bomb,z
2060 LET z=z+1: IF z=4 THEN LET
z=1
2070 REM LET a=LINE Plane\LET b=
COLUMN Plane\LET c=LINE Bomb
2075 IF c<>176 THEN RETURN
2080 LET a=a+10: LET c=(INT ((c+
4)/8))-32*(c>250): REM MOVE Bomb
,b,a
2090 RETURN
3000 FOR a=2 TO 31: LET b=INT (R
ND*10)+1: IF RND>.8 THEN GO TO 3
040
3010 LET d=INT (RND*5): FOR c=21
 TO 21-b STEP -1
3020 PRINT AT c,a; INK d; BRIGHT
 RND;"▩": BEEP .005,c+25: NEXT c
3030 PRINT AT c,a; INK d;"▲"
3040 NEXT a: RETURN
4000 REM LMTPARAM
4010 IF h$="plane" THEN GO TO 50
00
4015 IF h$="enemy" THEN GO TO 45
00
4020 LET o=176: REM LET p=CURREN
T h$\USE h$,h\MOVE h$,COLUMN h$,
o\ENABLE h$\USE h$,p
4030 CONTINUE
4500 REM LET o=LINE enemy
4510 LET o=o+11+INT (RND*6): IF
o>=150 THEN LET o=150
4520 IF o<20 THEN LET o=20
4530 LET p=255: REM MOVE enemy,p
,o\ENABLE enemy
4540 CONTINUE
5000 REM LET y=LINE Plane
5010 LET p=0: LET y=y+4: IF y>=1
68 THEN GO TO 5500
5020 REM MOVE Plane,p,y\ENABLE P
lane
5030 LET Score=Score-1: PRINT AT
 0,26;Score;"  "
5040 BEEP .005,60: CONTINUE
5500 LET a=176: LET b=0: REM MOV
E Plane,b,a\ENABLE Plane
5510 REM MOVE Enemy,b,a\ENABLE E
nemy
5520 REM ALL Bomb\MOVE Bomb,b,a\
ENABLE Bomb
5530 POKE 23681,0: CLS
5540 LET a$="YOU HAVE LANDED"
5550 LET w=2: LET t=1: LET x=0:
LET y=0
5560 PRINT INK 2;: REM LARGE
5570 LET Score=Score+200
5580 GO TO 1090
6000 REM INTPARAM
6010 IF h$="bomb" OR i$="bomb" T
HEN GO TO 7000
6020 IF h$="plane" OR i$="plane"
 THEN POKE 23681,0: GO TO 1000
6030 LET p=255: LET o=50: REM MO
VE enemy,p,o\ENABLE enemy
6040 CONTINUE
7000 IF h$="enemy" OR i$="enemy"
 THEN GO TO 7500
7005 IF i$="bomb" THEN LET h=i
7010 LET o=176: REM LET p=CURREN
T Bomb\USE Bomb,h\LET q=LINE Bom
b\LET r=COLUMN Bomb\MOVE Bomb,CO
LUMN Bomb,o\ENABLE Bomb\USE Bomb
,p
7020 LET q=INT (q/8): LET r=INT
(r/8): IF r>31 THEN LET r=31
7025 IF q>21 THEN LET q=21
7030 LET p=q+INT (RND*5)+1: IF p
>21 THEN LET p=21
7035 FOR o=q TO 10 STEP -1: PRIN
T AT o,r-1+(r=0);" ";AT o,r;" ";
AT o,r+1-(r=31);" ": BEEP .01,o+
30: NEXT o
7040 FOR o=q TO p: PRINT AT o,r-
1+(r=0);" ";AT o,r;" ";AT o,r+1-
(r=31);" ": BEEP .01,o+30: NEXT
o
7070 LET Score=Score+8-(Level*2)
: PRINT AT 0,26;Score;"  "
7080 CONTINUE
7500 LET o=50: REM MOVE Enemy,CO
LUMN Enemy,o\ENABLE Enemy
7510 IF h$="bomb" THEN LET i=h
7520 REM LET p=CURRENT Bomb\USE
Bomb,i\MOVE Bomb,COLUMN Bomb,o\E
NABLE Bomb\USE Bomb,p
7530 CONTINUE
8000 LET a$="BOMBER": LET x=8
8010 LET y=0: LET t=2: LET w=5
8020 PRINT PAPER 5; BRIGHT 1;"
8030 REM LARGE
8040 PLOT 0,160: DRAW 255,0
8050 LET a$="  A Game using"
8060 LET x=0: LET y=25
8070 LET t=1: LET w=2
8080 REM TEMPS\LARGE
8090 PLOT 0,0: DRAW 255,0
8100 DRAW 0,175: DRAW -255,0
8110 DRAW 0,-175: LET t=3
8120 LET w=6: LET x=8
8130 LET y=35: LET a$="FIFTH"
8140 PRINT INK 2;: REM LARGE
8150 LET t=2: LET w=1
8160 LET x=55: LET y=65
8170 LET a$="By RICHARD TAYLOR"
8180 PRINT INK 1;: REM LARGE
8190 PRINT AT 12,5;"Key 6 to mov
e down"
8200 PRINT AT 14,5;"Key 7 to mov
e up"
8210 PRINT AT 16,5;"Key 0 to dro
p a bomb"
8220 PRINT AT 18,3;"  You must c
lear a path to";AT 19,3;"land on
."
8230 LET a=3: REM OBJECT Bomb,a
8240 LET a=1: REM OBJECT Plane,a
8250 REM OBJECT Enemy,a
8260 REM PRINT Bomb,●
8270 REM PRINT Plane,▚\PRINT Ene
my,▞
8280 LET a=1: LET d=2: LET b=3:
LET c=6
8290 REM SPEED Bomb,b,c
8300 REM SPEED Plane,a,a
8310 REM SPEED Enemy,d,a
8320 PRINT INK 2;: REM COLOUR Bo
mb
8330 PRINT INK 1;: REM COLOUR En
emy
8340 LET a=7: REM VECTOR Bomb,a
8350 LET a=4: REM VECTOR Plane,a
8360 LET a=12: REM VECTOR Enemy,
a
8370 FOR c=3 TO 13 STEP 10
8380 FOR a=0 TO 500 STEP 10
8390 LET b=5: LET d=80
8400 REM SOUND b,c,d,a
8410 NEXT a: NEXT c
8420 PAUSE 100
8430 BEEP .2,-12: BEEP .2,-10: B
EEP .2,-8: BEEP .2,-12: BEEP .2,
-12: BEEP .2,-10: BEEP .2,-8: BE
EP .2,-7: BEEP .2,-5: BEEP .2,-5
: BEEP .2,-8: BEEP .2,-7: BEEP .
2,-5: BEEP .3,-5
8440 PAUSE 30
8450 FOR a=0 TO 7: PAPER a
8460 INK 9: PRINT PAPER a-1+8*(a
=0); INK 8;: REM REPLACE
8470 LET b=40: LET c=5: LET d=0:
 LET e=90+a
8480 REM SOUND b,c,d,e
8490 NEXT a: PAPER 7: INK 0
8500 LET a$="   Press any key to
 continue  "
8510 PRINT #0;AT 1,0; BRIGHT 1;a
$
8520 PAUSE 5: LET a$=a$(2 TO )+a
$(1)
8530 IF INKEY$="" THEN GO TO 851
0
8540 CLS
8550 PRINT AT 17,0; FLASH 1; BRI
GHT 1;"SELECT LEVEL:"
8560 PRINT "0 - Easy"
8570 PRINT "1 - Medium"
8580 PRINT "2 - Hard"
8590 PRINT "3 - Very Hard"
8600 INPUT "Please Select:";Leve
l
8610 IF Level<0 OR Level>3 OR Le
vel<>INT Level THEN GO TO 8600
8615 REM ERASE Plane
8620 RETURN
9000 RESTORE
9010 FOR a=USR "a" TO USR "a"+47
9020 READ b: POKE a,b: NEXT a
9030 RETURN
9040 DATA 0,0,0,0,56,124,124,56
9050 DATA 255,153,153,255,255,15
3,153,255
9060 DATA 24,60,126,255,255,153,
153,255
9070 DATA 0,152,145,159,223,153,
153,255
9080 DATA 0,0,249,35,255,255,16,
0
9090 DATA 0,0,159,196,255,255,4,
0
9500 SAVE "Bomber" LINE 9990: SA
VE "Data"CODE 61030,4338
9990 CLEAR 61029: LOAD ""CODE
9999 RUN
```

Just an example of the power of FIFTH

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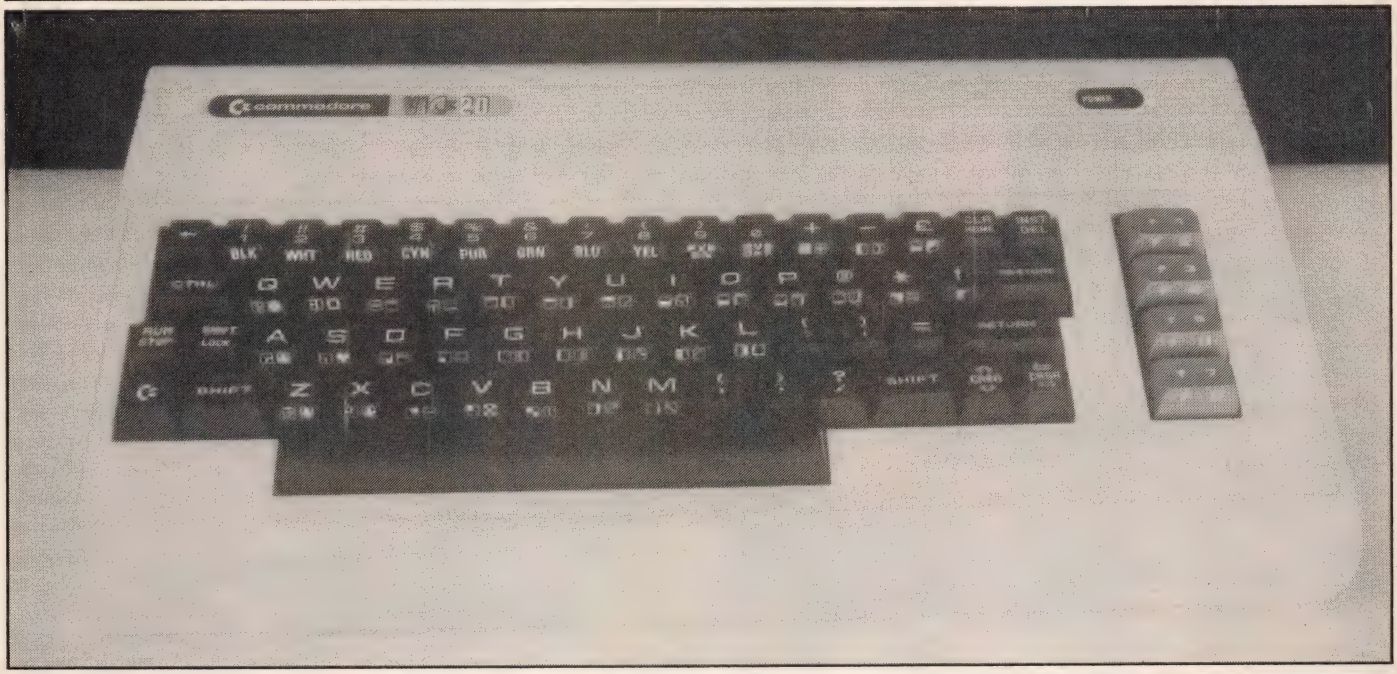
PCT

MICROSPOT

CLEAR SCREEN

Fergus McDonald has designed a useful utility to put at the end of a program to make black holes and other effects appear.



This is a short routine which can be put to good use in a game needing effects such as Black Holes or hyperspace environments.

The subroutine is designed to be put in at the end of a program and has the effect of squashing down the screen into a little box, clearing it and then returning it to its normal size.

POKE 36866 and 36867 are the locations of the registers within the VIC which control the columns and rows of the screen. CHR$ is the clear screen character.

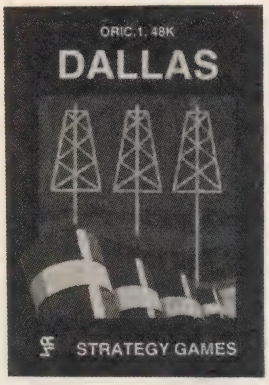
PROGRAM LISTING

```
Line 6000    AA = 150:BB = 174
     6001    FOR CC = 1 TO 21:
             AA = AA-1:BB = BB-2:POKE36866,
             AA:POKE36867, BB:NEXT
     6002    PRINT CHR$ (147);
     6003    FOR CC = 1 TO21:
             AA = AA + 1:BB = BB + 2:POKE36866, BB:NEXT
     6004    RETURN
```

PLANE SAILING

SPECTRUM ORIC ZX81 LASER BBC

AIRLINE Hijacks, strikes crashes and spiralling fuel costs must all be overcome if you are to succeed at this game. A wing and a prayer will not be enough to turn your £3 million to £30 million in the time allowed, but your financial wizardry will enable you to take over British Airways, or will it? Available for Spectrum 16K and 48K, Oric 48K, ZX81 16K, Laser 16K, BBC A & B



DALLAS Can you amass enough petro dollars to take over the Euing empire. Cut throat business and an eye for the main chance may get you there but you'll need nerves of steel to become the oil king of Dallas. Available for Spectrum 16K and 48K, Oric 48K, ZX81 16K, Laser 16K, BBC Model B.

CAMELOT As the banished Arthur Pendragon Excalibur is just one of the seven items you must find. They are all hidden in the countries shown on the map. Find all seven without falling prey to the Brigands, Dragons and Evil Magicians that stand in your way and make a triumphant return to Camelot to be crowned King. Available for Spectrum 48K, ZX81 16K and Laser 16K.

CORN CROPPER Limited cash and droughts are two of the problems facing the farmer. Planting fertilizing and harvesting must all be done economically if you are to reap the rewards offered in Corn Cropper. You choose the methods that will bring you success. Available for Spectrum 48K, BBC Model A & B (Called Farmer for the ZX81 16K).

Prices: ZX81 16K, Spectrum 16K, Laser, **£5**; Spectrum 48K **£6**; Oric 48K, BBC, **£6.95**

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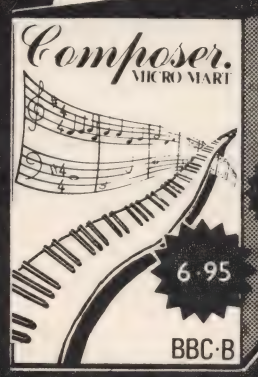

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FACTFILE

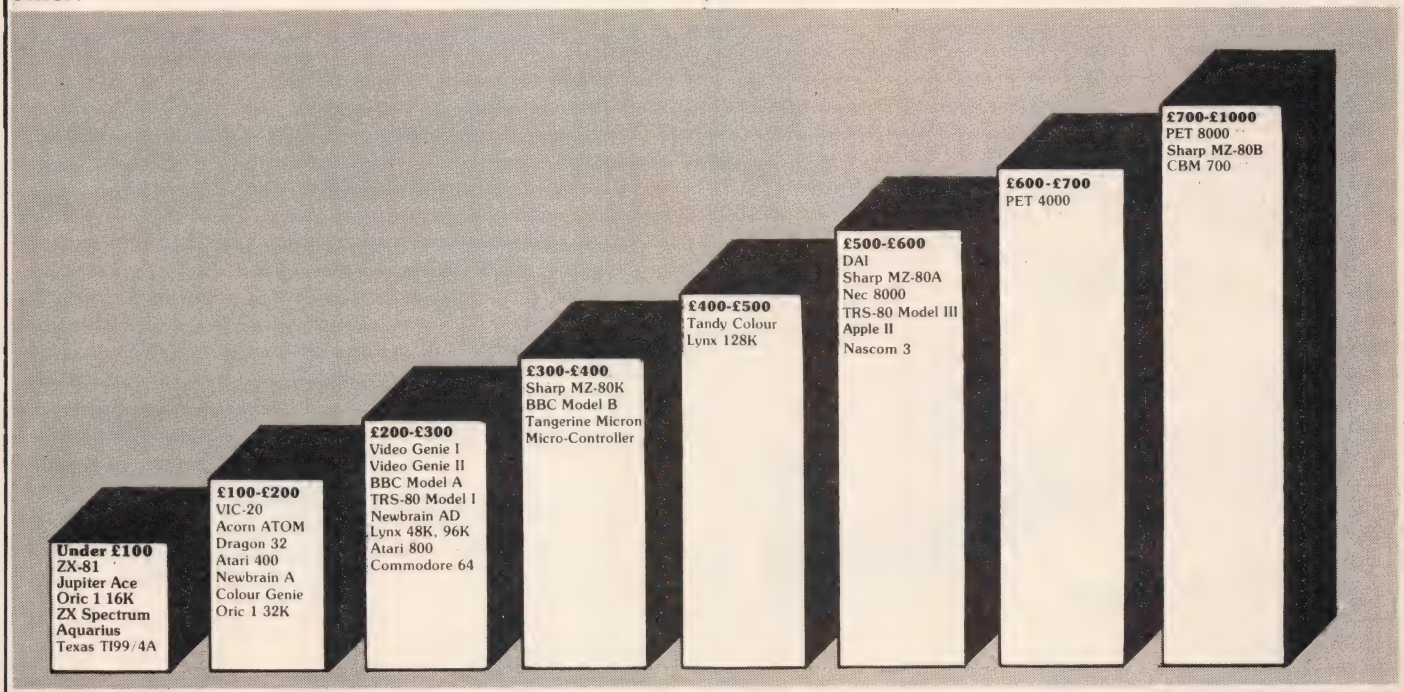
MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 28 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

Just look down the price index to discover which machines are in your price-range and then consult the 'cards' on each. All the information is in a standard form and has all been checked by our technical staff. The section is presented alphabetically.

As new machines become available, we will add them into the FACTFILE as soon as we can.



Factfile

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in "thousands of bytes" or "K" ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline – you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate – don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look and see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

SIZE OF BASIC: The number of bytes occupied by the BASIC language is important, as it is an approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

VIDEO OUTPUT: an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

REFERENCE

FACTFILE

ATARI 400

Atari UK Ltd,
Atari House,
Railway Terrace,
Slough, Berks
SL2 5BZ.

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£149.99**

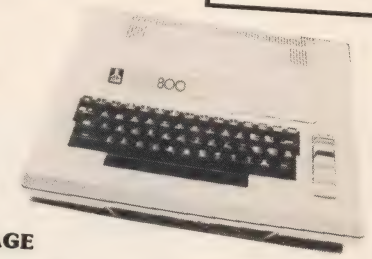
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£199.90
Monitor	No	—
Disc Drives	Yes	£299.99
Other Languages	Yes	£39-79
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microctonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95

ATARI 800



Atari UK Ltd,
Atari House,
Railway Terrace,
Slough, Berks
SL2 5BZ.

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£299.99**

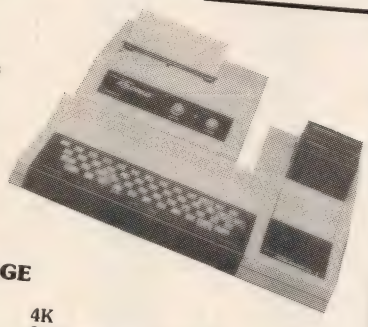
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	Yes	£199.99
Printer	No	—
Monitor	Yes	£299.99
Disc Drives	Yes	£39.79
Other Languages	No	—
Multi-user Capabilities	Yes	TBA
BASIC extensions (Toolkits)		

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Carrying case,** CJE Microcomputer, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50

AQUARIUS



Mattel Electronics
(UK) Ltd
Mattel House
North End Road
Wembley Park,
Middx HA9 0AB

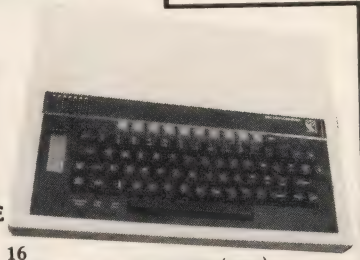
STANDARD PACKAGE

Memory Size (RAM)	4K
Screen Size	24 lines of 40 characters
Expansion Sockets	Yes
Display Unit Included?	No
Tape Included?	No
Usable Domestic TV?	Yes
Size of BASIC	2K
Average Price	**£79.95**

MANUFACTURERS EXPANSIONS

	DETAILS	PRICE
RAM	4K or 16K to 52K	£19.95, £30
Printer	Yes	
Monitor	No	£139.95
Disc Drives	No	
Other Languages	Logo	
Multi-user Capabilities	No	
BASIC Extensions (toolkits)	Yes	£29.95

BBC MICROCOMPUTER



BBC Model A,
BBC Microcomputer
Systems,
PO Box 7,
London W3 6JX.

STANDARD PACKAGE

Memory Size (RAM)	16
Screen Size	32 lines of 40 characters (max)
Expansion Sockets	Parallel serial output, analogue output, Bus connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£299**

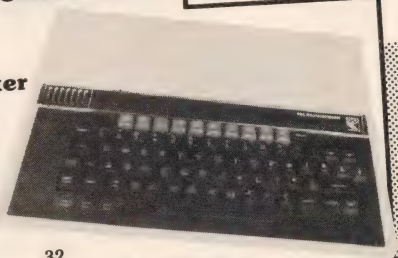
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	—
Monitor	Yes	£200
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-user Capabilities	Yes	—
BASIC extensions (Toolkits)	TBA	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Street Close, Guildford, Surrey GU1 4UN, Tel: 0483 50321, £199-799; **BBC Cassette Recorder,** Microage Electronics, 135 Hale Lane, Edgeware, Middx, £28; **Colour Monitor,** PortaTel Conversions Ltd, 25 Sunbury Cross Centre, Staines Roach West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Newitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ, £95.00; **Analogue Joystick, Light Pen,** Stack Computers, 290-298 Derby Road, Bootle, Liverpool.

BBC MICROCOMPUTER



BBC Model B
BBC Microcomputer Systems,
PO Box 7,
London W3 6JX

STANDARD PACKAGE

Memory Size (RAM)	32
Screen Size	30 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue output, printer BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£399**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	TBA	TBA
Monitor	No	—
Disc Drives	TBA	TBA
Other Languages	TBA	TBA
Multi-user	Yes	—
Capabilities		
BASIC extensions (Toolkits)	TBA	TBA

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, Tel: 0483 503121, £199-799; **BBC Cassette recorder,** Microage Electronics, 135 Hale lane, Edgware, Middx, HA8 9QP, £28; **Colour Monitor,** Portatel Conversions Ltd, 25 Sunbury Cross Centre, Saires Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit,** Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk, IP33 1HQ, £95.00; **Carrying Case,** CJE Microcomputers, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50.

COMMODORE PET 4000

Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

Memory Size (RAM)	16 or 32K
Screen Size	25 lines of 40 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£632.50, £799.25**

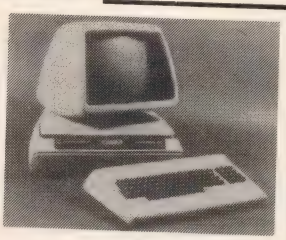
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes several	£454-1604
Monitor	N/A	—
Disc Drives	Yes	£396
Other Languages	Yes, single or dual	£454-1029
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Estate, Ashford, Kent, £82.95; **64K DRC Module,** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE PET 8000



Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

Memory Size (RAM)	32K or 96K
Screen Size	25 lines of 80 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£980, £1374**

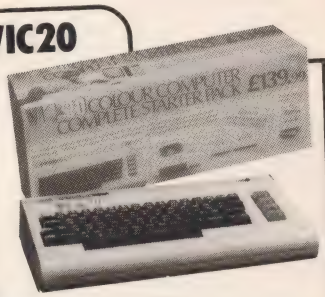
MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£454-1604
Monitor	N/A	—
Disc Drives	Yes single or dual	£454-1029
Other Languages	Yes	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Bunley Road, London NW10, £149; **TMS 5100 Talking Board,** GM Microtronics Ltd, Unit 14, Godinton Way industrial Easte, Godinton Road, Ashford, Kent, £82.95; **64K DRC Module** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE VIC20
STARTER PACK



Commodore,
675 Ajax Avenue,
Slough, Berks

STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£139.99**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	3K,8K,16K expansion options	£30,£45,£75
Printer	Yes	£270
Monitor	No	—
Disc Drives	Yes	£396
Other Languages	Yes	£38.95
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

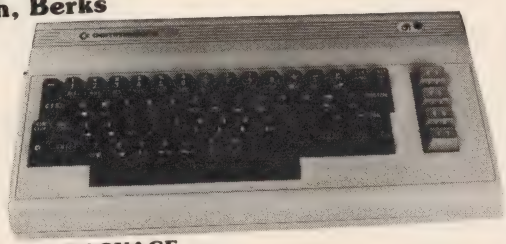
OTHER ADD-ONS:

VCR-20,
20K RAM cartridge, Audio Computers, 87 Bournemouth Park Road, Southend on Sea SS5 2JJ, £39 kit, £45 built; **Expansion Board,** 3K-16K, Arfon Microelectronics Ltd, Gibyn Industrial Estate, Caernafon, Gwynedd, Wales LL55 2BD, £220. Languages: VIC Forth, Adda Computers, 154 Victoria Road, Acton, London, W3.

FACTFILE

COMMODORE 64

Commodore,
675 Ajax Avenue,
Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS, Serial, Video
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£229.**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	–
Printer	Yes	£230-276
Monitor	No	–
Disc Drives	Yes	£229
Other Languages	Yes	–
Multi-user Capabilities	Yes	–
BASIC Extensions	Yes	–

OTHER ADD-ONS:

Light Pen, 4 slot motherboard, Joystick, RS232 Interface, Stack Computers, 290-298 Derby Road, Bootley Liverpool. 051-933 5511.

DRAGON 32

Dragon Data Ltd
Queensway,
Swansea
Industrial Estate,
Swansea, SA5 4EH

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

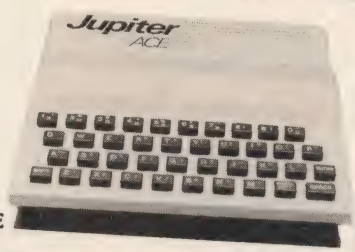
	DETAILS	PRICE
RAM	–	–
Printer	No	–
Monitor	No	–
Disc Drives	No	–
Other Languages	Yes	–
Multi-user Capabilities	No	–
BASIC extensions (Toolkits)	No	–

OTHER ADD-ONS:

Joystick, Light Pen, 4 slot motherboard, Stack Computers 290-298 Derby Road, Bootle, Liverpool. 051-933 5511.

JUPITER ACE

Jupiter Cantab
22 Foxhollow
Bar Hill
Cambridge
CB3 8EP



STANDARD PACKAGE

Memory Size (RAM)	3K
Screen Size	24 lines of 32 characters
Expansion Sockets	Not known
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	Resident language is FORTH at 8K
Average Price	**£89.95**

MANUFACTURER'S EXPANSIONS

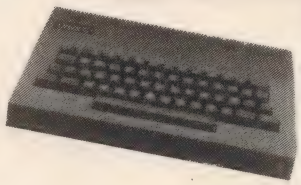
	DETAILS	PRICE
RAM	TBA	–
Printer	TBA	–
Monitor	TBA	–
Disc Drives	TBA	–
Other Languages	TBA	–
Multi-User Capabilities	TBA	–
BASIC extensions (toolkits)	TBA	–
	N/A	–

OTHER ADD-ONS:

None Reported.

LYNX

Camputers
33a Bridge Street,
Cambridge CB2 1UW



STANDARD PACKAGE

Memory Size (RAM)	48K,96K,128K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	1.5K
Average Price	**£225, £299, £445**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	96K for 48K version	£89.95
Printer	Yes	–
Monitor	Yes	–
Disc Drives	Yes	–
Other Languages	Yes	–
Multi-user Capabilities	Yes	–
BASIC extensions (Toolkits)	Yes	–

OTHER ADD-ONS:

ORIC 1

Oric Products International,
Coworth
Mansion,
Coworth Park,
London Road,
Sunninghill, Ascot,
Berkshire, SL5 7SE.

STANDARD PACKAGE

Memory Size (RAM)	16K, 48K
Screen Size	28 X 40
Expansion Sockets	Yes
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£99.95, £139.95**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	N/A	—
Printer	TBA	—
Monitor	No	—
Disc Drives	TBA	—
Other Languages	N/A	
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	TBA	—

OTHER ADD-ONS:

SHARP MZ-80A

Sharp UK Ltd,
Thorn Road,
Newton Heath,
Manchester
M10 9BE
Tel: 061-205 2333

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£549**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SHARP MZ-80K

Sharp UK Ltd,
Thorn Road,
Newton Heath,
Manchester
M10 9BE

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	**£350**

MANUFACTURER'S EXPANSIONS

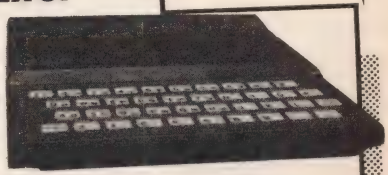
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SINCLAIR ZX 81

Sinclair Research,
6 Kings Parade,
Cambridge CB2 1SN



STANDARD PACKAGE

Memory Size (RAM)	1K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	**£49.95 built**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K RAM pack	£29.95
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4 1XL, £39.95-79; Memory Expansion 64K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey: £59.95; **Key Bleep Unit,** Microtronix, 3 Buxton Avenue, Coulton, Nottingham, N94 3RR, £8.85 kit, £9.95 built; **Maximem 1.1,** East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London, EB4 8T, £93.50; **Music Synthesiser + 16 line control port,** William Stuart Systems Ltd, Dower House, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD, £19.50; **Full-size keyboard,** Protos Computer Systems, Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; **ZX99 Automatic tape control,** Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.

FACTFILE

SINCLAIR ZX SPECTRUM

Sinclair Research,
6 Kings Parade,
Cambridge, CB2 1SN

STANDARD PACKAGE

Memory Size	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	**£99.95**

MANUFACTURER'S EXPANSIONS

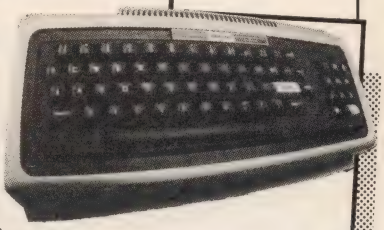
	DETAILS	PRICE
RAM	48K RAM for 16K version	£60
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	ZX Microdrive	TBA
Other Languages	No	—
Multi-user Capabilities	No	TBA
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory Expansion 32K, Downsway Electronics (UK) Ltd, Dept M, Downsway House, Epsom Road, Ashtead, Surrey; £42.50

TANDY TRS 80 I

Tandy Corporation,
12th Floor,
Tameway Tower,
Walsall,
West Midlands
WS1 1LA.



STANDARD PACKAGE

Memory Size (RAM)	4 or 16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	**£229 or £339**

MANUFACTURER'S EXPANSIONS

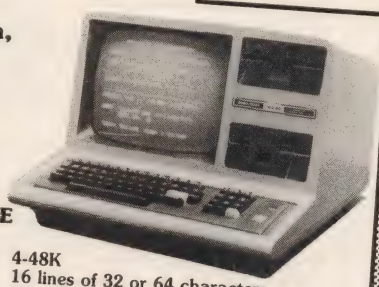
	DETAILS	PRICE
RAM	32K extra in expansion unit	£349
Printer	Yes	
Monitor	Yes	£239-1200
Disc Drives	Yes	£100
Other Languages	Yes	£369
Multi-user Capabilities	No	£100
BASIC extensions (Toolkits)	Yes	—
		£100

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kran Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC) 46 Middle Street, Blackhall, Marlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

TANDY TRS 80 III

Tandy Corporation,
12th Floor,
Tameway Tower,
Bridge Street,
Walsall,
West Midlands,
WS1 1LA



STANDARD PACKAGE

Memory Size (RAM)	4-48K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection, parallel & serial output
Tape Included?	No
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	**£599-1799**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K modules	£70
Printer	Yes various	£239-1200
Monitor	N/A	—
Disc Drives	Yes	£600
Other Languages	Yes	£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17, Highcross St, Leicester LE1 4PF, £179-349; **48K internal RAM,** General Northern Microcomputers, (GNOMIC), 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM card,** Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

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Memory Size (RAM)	16-32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Serial output, ROM pack, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-16K
Average Price	**£499**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£239-1200
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Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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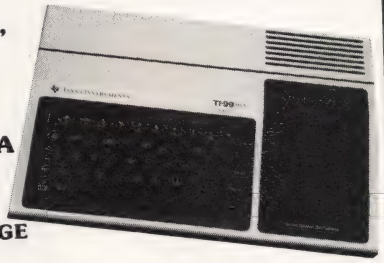

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	**£199**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	Yes	£50-£100
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

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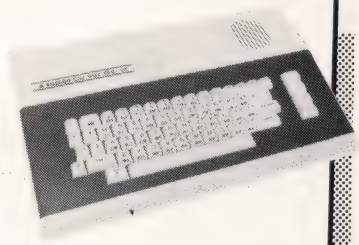

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	24 lines of 40 characters
Expansion Sockets	Parallel & serial output, expansion BUS
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	**£168**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K	£38.56
Printer	Yes	£220
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

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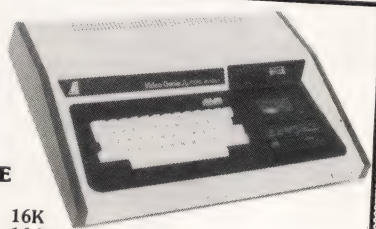

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 64 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	12K
Average Price	**£279**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213 **48K Internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Martlepool, Cleveland, £70 + VAT: **32K RAM Card** Audio Computer, 87 Bournmouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

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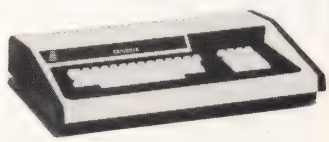

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	13K
Average Price	**£299**

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey, Gul 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM Card** Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

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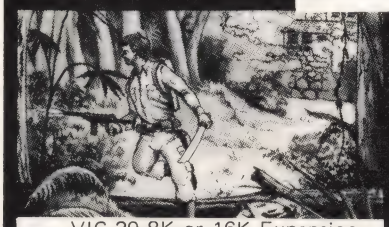

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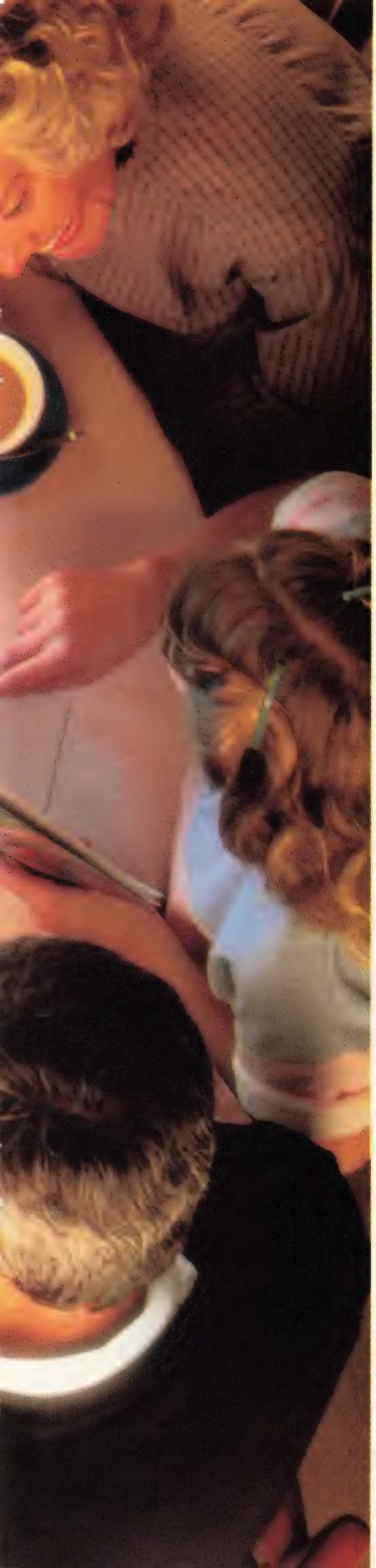

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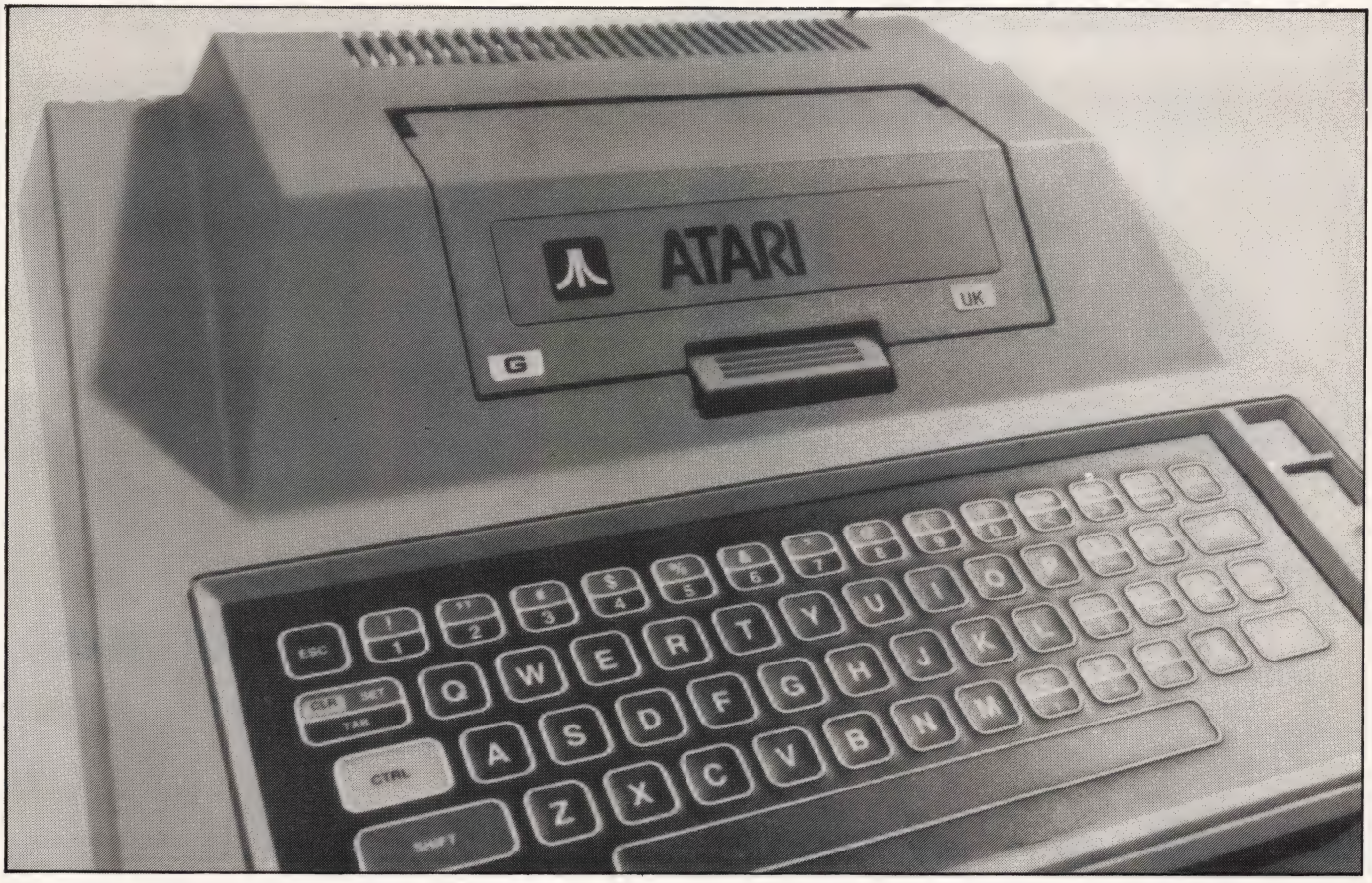

Get to know the guts of your machine with this informative piece by M.W. Davies.

Have you ever wondered what happens when your Atari computer encounters one of the following instructions?

OPEN #1,4,0"K:" PUT #1,K:
OPEN #1,8,0,"E:" GET #1,K:
OPEN #1,8,0,"S:" LOAD"D:
LIST"P.

The characters indicate to the internal program (operating system o.s.) which device we are referring to.
The standard accessible devices are:

Keyboard _____K:
Display _____S:
Editor _____E:
Cassette _____C:
Printer _____P:
Disc_____D:

These devices can all be utilized assuming a cassette, printer, and disc are connected. You could if you wanted, change these characters i.e. Change "C" for cassette to "T" for tape simply by POKE 797,84.

Now use the command LOAD"T: to load from tape (cassette). Also you can use all the other commands such as: SAVE"T:,ENTER"T: , LIST"T: You will find the cassette functions exactly the same way as before when you used "C". You cannot however use "TLOAD" instead of "CLOAD" as this is a "BASIC" command interpreted by the "BASIC CARTRIDGE" which then passes the relevant device information on to the operating system. "CLOAD" will produce an error because "BASIC" will pass on information for a device "C"; the o.s. will then try to refer to C in its tables and will not now find a reference as we have changed the reference to "T".

Now try: POKE 809,70. You will find that instead of "D" for "DISC" you will have to use "F" for "FLOPPY". To return to the original "C" and "D" just press "System Reset".

In addition to being able to change these device addressing characters it is possible to add a further six characters which, with the necessary additional handler programs, will allow you to put other devices onto your computer, or for an associated program to execute some particular task not already part of the existing operating system.

In the course of this article, by way of a simple example I will add the device character "B" with its associated handler program, which whenever used in BASIC i.e. LIST "B:, will cause the keyboard speaker to beep continously. Not a particularly useful device but an example which I hope will be simple enough to demonstrate the facility available for adding extra "device handlers". This term will be further explained in the text.

Interface Achievements

By way of a little incentive to try and understand the explanations ▶

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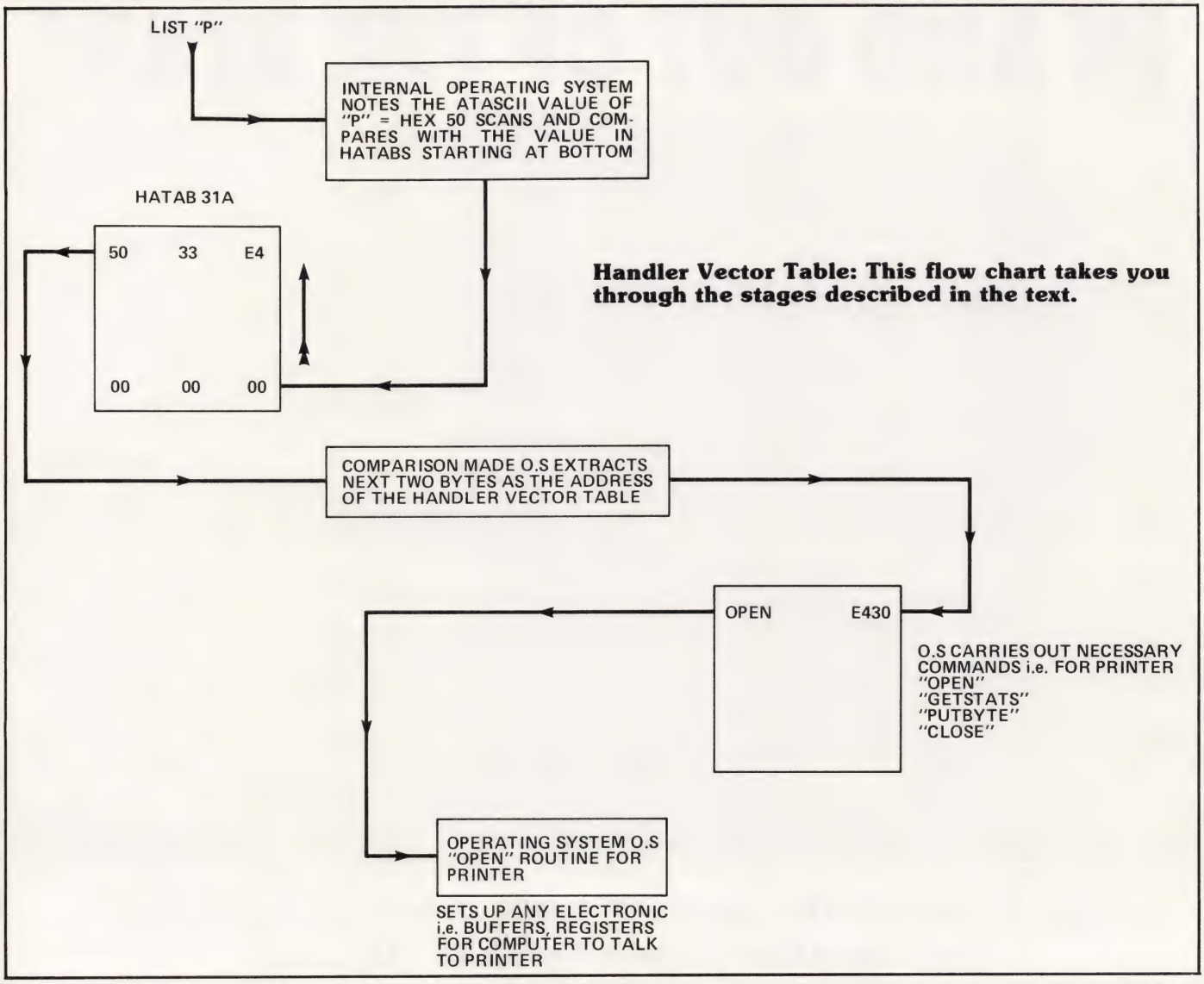

Handler Vector Table: This flow chart takes you through the stages described in the text.

within this article, I might add that after I had finally understood the technique involved I was able to interface several different printers, serial and parallel, to my Atari computer without using any extra electronic hardware. In one instance a very minimum of simple logic buffering was required. The possibilities are there to interface virtually any logic device i.e. printers, magnetic tape, hard disc or even talk directly to another computer.

The reason all this is possible is due to the manner in which Atari designed their operating system which is the program permanently resident in the computer irrespective of any cartridges being present or not.

With the o.s. is a program called Central Input Output (CIO). Anybody who's seen "TRON" should have a good idea as to it's function. Basically CIO has the responsibility of looking after any input or output to devices connected to the computer. It could also link us to other programs as intimated earlier, these programs being made to respond in a manner similar to a device.

Whenever a device character i.e. C or K is used within a program or as a direct command, the o.s. looks up in a table called "HATABS" (Handler Tables) information which guides the o.s. to other programs used by CIO for that particular device. HATABS is a table resident in RAM starting at address 794(Decimal),31A(Hex). It is loaded there by the o.s. everytime the computer is powered on or "system reset" is pressed. It consists of 12 × 3 byte entries plus two bytes at the end always containing zeroes. Every 3 bytes refer to a particular device.

The two bytes following the first (device character byte) are addresses of other tables within the o.s. called "HANDLER VECTOR TABLES", to be explained more fully as we progress. Thus if we input at the keyboard LOAD"C (we're back to using "C" for

HATABS (at power up or after "reset")

Memory Address	3 Bytes				
31A	50	75	80	50 =	ATASCII "P"rinter
31D	43	40	E4	43 =	" "C"assette
320	45	00	E4	45 =	" "E"ditor
323	53	10	E4	53 =	" "S"creen
326	4B	20	E4	4B =	" "K"eyboard
329	44	CB	07	44 =	" "D"isc
32C	00	00	00	No entry	
32F	00	00	00	"	"
332	00	00	00	"	"
335	00	00	00	"	"
338	00	00	00	"	"
33B	00	00	00	"	"
33E	00	00		Last 2 bytes always zero	

cassette again), the o.s. will recognise the C and start comparing the bytes in HATABS starting at the bottom and working upwards until it finds a comparison. The o.s. then looks at the next two bytes which give it the address E440 (HEX) of the Handler Vector Table for the cassette. What we did earlier was to change the value from "C" (43) to "T" (54 84 DEC).

When we said LOAD"T, o.s. searched and found a comparison where "C" would normally be found. Continuing our example using "C" we were referred to another table starting at address E44o.

CASSETTE HANDLER VECTOR TABLE

mem addr	contents	
E440	4B	OPEN
	EF	VECTOR
	2A	CLOSE
	F0	VECTOR
	D5	GETBYTE
	EF	VECTOR
	0F	PUTBYTE
	F0	VECTOR
	27	GETSTAT
	F0	VECTOR
	4A	SPECIAL
	EF	VECTOR
	4C	JUMP
	41	INIT
	EF	CODE

CIO COMMAND ROUTINES

OPEN

Sets up any necessary electronic registers and timing. Checks to ensure that the device is not already OPEN i.e. in use. Returns to o.s. stating the success or failure to set up.

GETSTAT

Device controller is interrogated to determine if device is available and ready to either send or receive data. This status information is passed back to o.s.

CLOSE

The handler program is expected to conclude any transactions between the device and computer:
1) Send any remaining data to device.
2) Mark end of file i.e. cassette or disk.
3) Update any directories or allocation maps being used.

GETBYTE

This routine is called in response to "GET CHARACTERS" or "GET RECORD". The handler gets byte of data from the device and passes it on to o.s. for further handling.

PUTBYTE

This routine is called in response to "PUT CHARACTERS" or "PUT RECORD". The handler accepts a single byte and passes it to device or device buffer.

SPECIAL

This routine handles functions that are not handled by the other entries such as: Disk file "RENAME", display "DRAW", etc.

Enter the program in Basic or for the Assembler "hackers", the listed assembler program. The assembler program is more informative if you understand assembler programming. Using the Basic program just "RUN" and then try "LIST"B " or "ENTER"B "

The assembler program was written to be an Autorun.sys program but if you go into BUG and G600 (ATARI ASSEMBLER) then go back into EDITOR mode and try "SAVE #B" or "LOAD #B". If you press "System Reset", which you will probably have to, then it will be necessary to repeat the above running instructions. Can you guess why?

PROGRAM LISTING

```
50 FOR D=0 TO 40
60 READ A
70 POKE 1552+D,A
80 NEXT D
90 DATA 169,7,141,31,208,32,35,6,169,15,141,31,208,32,35,6,76,16,6,162,255,202,208,253
100 DATA 96,160,1,96,15,6,40,6,42,6,42,6,42,6,4,41,6
110 POKE 824,66
120 POKE 825,44
130 POKE 826,6
140 STOP
```

PROGRAM LISTING

```
05   *=$600
10    LDA#$42  ADD "B" TO HATAB
20   STA $338
30   LDA#ADDR&255  ENTER ADDRESS VECTOR
40   STA$339
50   LDA#ADDR/256
60   STA$33A
70   RTS
0100 BEG LDA#$07  MAKE KEYBOARD
0110  STA$D01F  SPEAKER BEEP
0120  JSR DELAY
0130  LDA#$0F
0140  STA $D01F
0150  JSR DELAY  END OF BEEP
0160  JMP BEG  GO BACK AND DO IT AGAIN
0170 DELAY LDX#$FF  DELAY ROUTINE
0180 DEX DEX
0190  BNE DEX
0200  RTS
0210 SUCCESS LDY#1
0220  RTS
0250 ADDR .WORD BEG-1  OPEN
0260  .WORD SUCCESS-1  CLOSE
0270  .WORD SUCCESS+1  GETBYTE
0280  .WORD SUCCESS+1  PUTBYTE
0290  .WORD SUCCESS+1  GETSTAT
0300  .BYTE 4C  JMP
0310  .WORD SUCCESS  INIT
0320  .END
```

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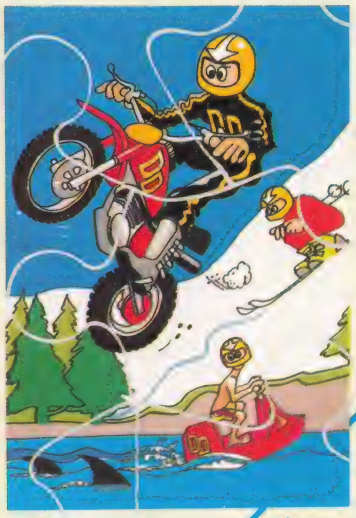

ELECTRON

PENGI *VE·03·32*

Wandering around an ice flow may seem to be an idyllic way of life to some people, but my advice to such philanthropists is: try it. It's not that life out here is a bore. I mean, I lose all my aggressions kicking the hell out of ice blocks. 'Strange habit,' I hear you say; but you don't know what's going on around here. Let me fill you in. It's quite simple really. If you want to get from 'A' to 'B' around here you have to go via 'C'. This is largely due to the area's ice making machine going beserk and trying to compete with Mother Nature. This overgrown refrigerator thought anything nature could do it should better. I could live with this if it was the only problem since I'm beginning to enjoy this bizarre ice hockey. Unfortunately this is the least of my worries. The other penguins around here have been eating plankton for so long they're starting to radiate from all the trace elements they've been consuming — and I think it's affected their brains as these possessed pengis seem to hate any of their brothers who doesn't look like them — and I am not about to stay here and argue with them — anyway, whoever heard of a penguin having a conversation . . .
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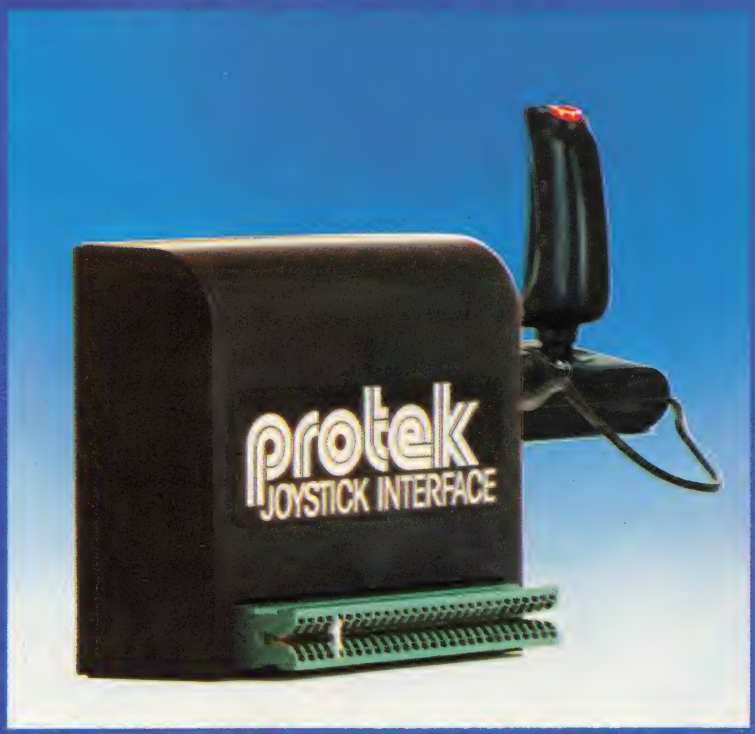

If you want Arcade quality control for your Sinclair ZX Spectrum, you'll find the Protek combination hard to beat. The interface is compatible with a range of software including a number of titles from: ULTIMATE, SILVERSOFT, RABBIT SOFTWARE, QUICKSILVER, QUEST, PSION, NEW GENERATION SOFTWARE, IMAGINE, OCEAN, plus many more.

The protek joystick interface is simple to use. It just plugs in at the back of your Spectrum and is compatible with any "Atari type" Joystick Connector. We recommend the Spectravision Joystick at only £9.95 for Pistol Grip Joystick with a top and base fire button plus specially contoured shape and rubber suction cup footing for single hand operation.

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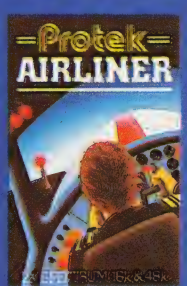
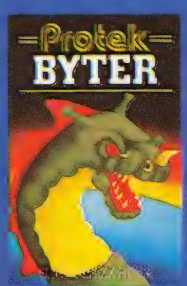


ZX Spectrum 16k & 48k

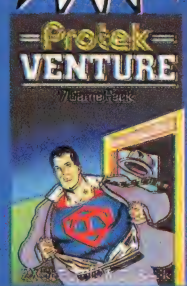


Sinclair ZX 81 16k

ZX Spectrum 16k & 48k

ZX Spectrum 48k

Sinclair ZX 81 16k



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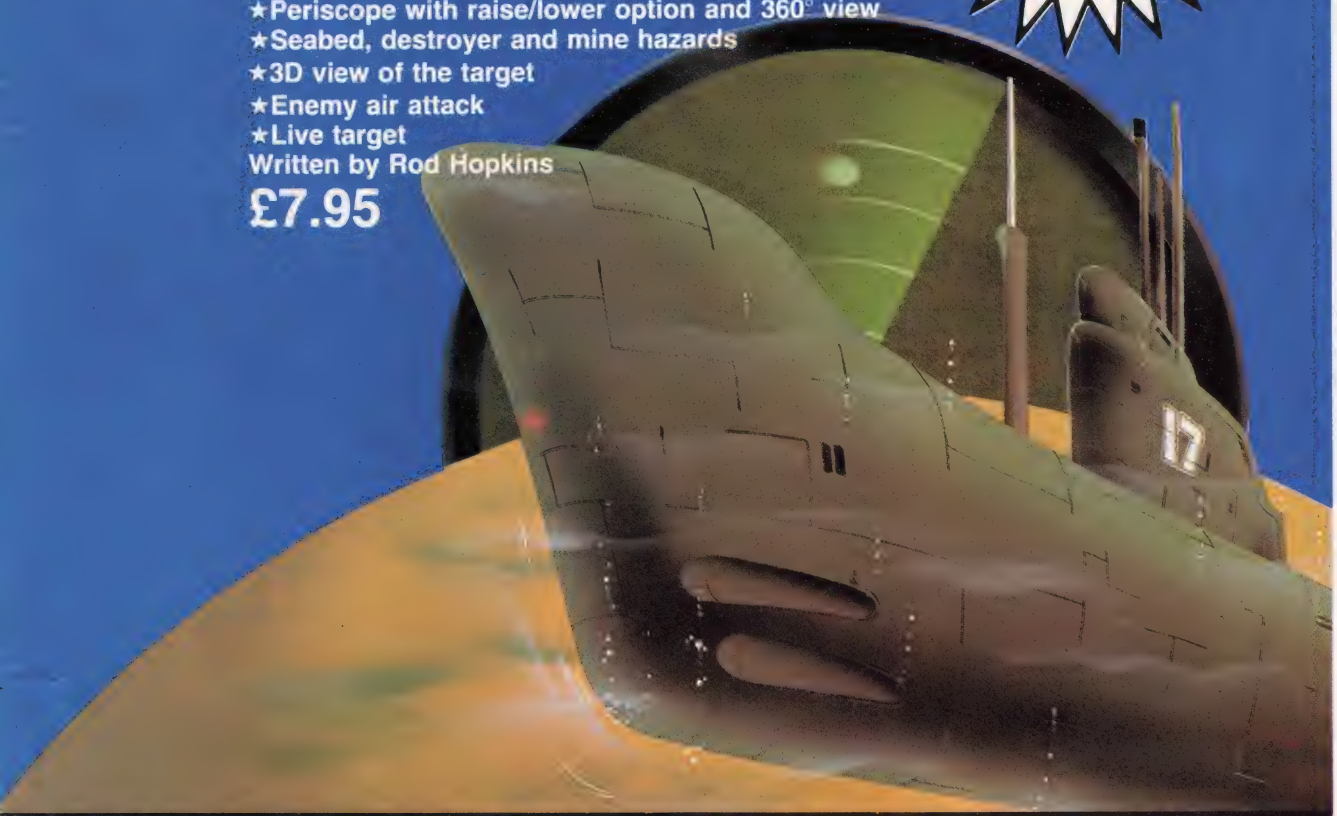

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1 KRAKATOA – 48K SPECTRUM – £5.95

. . . "My whole body ached as I scrambled back into the chopper . . . the subs were back! In the five days that the tanker had been sheltering in the bay, not one hour had gone by when they hadn't tried to dispatch a defenceless tanker to the deep . . . The rockets were coming in over Krakatoa and the constant explosions had brought the volcano to life! I had a tough choice to make, I could stay with the tanker and make sure it didn't end up like the others, or get the islanders off the volcano, it wasn't going to be easy! Almost impossible! But I was going to try both! Arming the rockets I lifted off and headed for trouble . . ."

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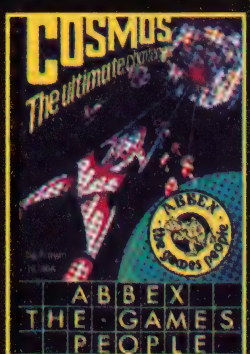

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It's feature packed. With over sixteen different boards, each with gradually increasing difficulty. Manipulate your submarine past 10 different types of danger. Avoid depth-charges, force-fields, booby traps, rocks, enemy submarines, mines, crabs, sharks, underwater missiles, mazes and whole hosts of under water hazards as you battle your way to Atlantis. Supreme colour, sound, and graphic action. All machine coded with joy-stick option, 2-player option and high score.

6 SPIDER STORM — UNEX. VIC 20 — £5.95

The enormous XITAN 1 rocket streaked skywards, its vital mission to save the last remnants of the human race that resided in its holds. Dennis Droid sat contently in the hatchery quietly reviewing his new and important job. When suddenly the ship shook violently as it was invaded by swarms of the most devilish destructive spiders you could possibly imagine. Dennis sprung into action, seizing his Megadon Atomizer he began blasting . . . Take that! and that! "ZAP!! POW!! The battle continued . . . "How many can there be left?!!

7 WAR GAME — 16K SPECTRUM — £5.95

I couldn't believe my eyes, but there they were, the telltale red lines I'd seen so often in training. Fourteen years of boredom in this seat and it had happened! As if in a dream my hand flashed across the terminal keyboard, storing, projecting and calculating. The computer helped, but I pressed the buttons! destroying those evil missiles before they struck the cities below! Was this the end!

8 E.T.X — 16-48K SPECTRUM — £5.95

"Home computing" magazine say . . .
Speech is effective and must be at the limit of Spectrum capabilities, graphics are excellent and animation superb. A combination of graphics adventure, maze and chase games, makes this an unusual fascinating and addictive program which must rank among the Spectrum classics." VALUE FOR MONEY 100%! GRAPHICS 100%! SCORE 100%! This is an objective assessment by an independent body. There can be no doubt that this is the best.

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SOFTWARE FROM COMPUTING TODAY

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The Valley is a real-time game of adventure and survival. You may choose one of five character types to be your personal 'extension of self' to battle and pit your wits against a number of monsters. Find treasure, fight a Thunder-Lizard in the arid deserts of the Valley, conquer a Kraken in the lakes surrounding the dread Temples of Y'Nagioth or cauterise a Wraith in the Black Tower. In fact live out the fantasies you've only dared dream about. BUT BEWARE . . . more die than live to tell the tale!
You've read the program (Computing Today — April '82) . . . Now buy the tape. Tape versions (£11.45 each inc P&P and VAT) available for: ZX Spectrum (48K), Atari 400 and 800 (32K) BBC Model A and B, and VIC-20 (with 16K RAM pack).
Disc version (£13.95 each inc P&P and VAT) available for: Apple II (DOS 3.3), Sharp MZ-80A and PET 8032 (8050 drives).

A complete reprint of the Valley article is also available for those wishing to do their own conversions for £1.95.

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ASP SOFTWARE

WINTER 1983
An Argus Specialist Publication
Personal
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Learn about BASIC by playing games
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SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

GM = Game
BS = Business routine
UT = Utility (ie. programming aid)
DO = Domestic
ED = Educational

How Sold

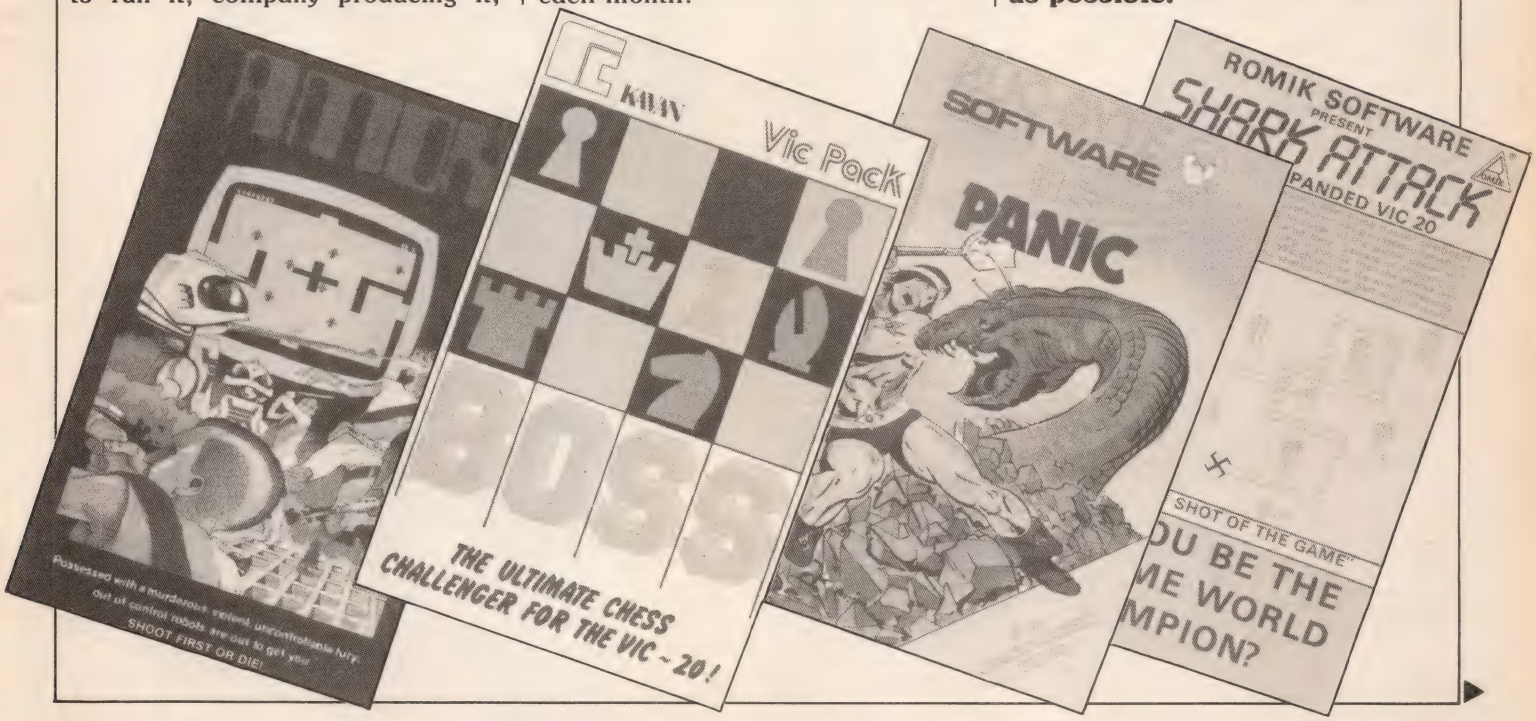
R = Cartridge (may include memory)
C = Tape (cassette)
D = Disc (for expanded systems)
L = Listing (sold as print-out)

Due to overwhelming response we have been forced to alternate machines included in our checklist each month.

This month, we have recoded all the dealers, and their names and addresses will now appear in the section to which they refer. This should lead to clearer referencing and help your search.

Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for *any* of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please!*) or ring Jane Price on 01-437 1002 as soon as possible.



SOFTWARE LISTING

ATOM

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Asteroids	Gm	Program Power	5K	C	PR	£6.85
747 Flight simulator	Gm	Bug Byte	12K	C	BR,AN,EL	£8.00
Adventure	Gm	Program Power	12K	C	BR,PR	£9.15
Adventures	Gm	Acornsoft	12K	C	MIo	£30.00
Air Attack	Gm	Program Power	12K	C	BR,PR	£9.15
Air Attack	Gm	Program Power	12K	C	PR	£7.95
Air Strike	Gm	Pro S/W	9K	C	PS	£6.00
Alien Maze	Gm	Program Power	8K	C	PR	£5.69
Astrafire	Gm	Program Power	5K	C	PR	£4.54
Astro Birds	Gm	Program Power	12K	C	BR,PR	£9.15
Atom Adventure	Gm	Acornsoft	12K	C	EL,AC	£11.50
Atom Adventure	Gm	Hopesoft	12K	C	HO	£6.75
Atom Business Games	B/G	Program Power	12K	C	PR	£7.99
Atom Business Cassette	Bs	Acornsoft		C	AC	£7.50
Atom Business Pack	Bs	Acornsoft		C	MIr,COu	£11.50
Atom Chess	Gm	Acornsoft	12K	C	EL,AC,AN	£11.50
Atom Chess	Gm	Acornsoft	12K	C	PR	£11.44
Atom Forth	Ut	Acornsoft		C	EL,AC,AN	£11.50
Atom Life Category	Bs	Acornsoft		C	AC,EL	£11.50
Atom List	Ut	Acornsoft		C	AC	£17.25
Atom Man	Gm	Hopesoft	12K	C	HO	£6.75
Atom Store	Bs	Program Power	12K	C	PR	£9.15
Atom Synthesiser	Gm	Acornsoft	12K	C	AC,EL	£11.50
Atomic Cube	Gm	A&F S/W	12K	C	AA	£4.95
Backgammon	Gm	Bug Byte	7K	C	BR	£7.00
Blitz	Gm	Rucksoft	4K	C	R	£2.65
Chaser	Gm	Hopesoft	4K	C	HO	£3.75
Chess	Gm	Bug Byte	12K	C	BR,AN,EL	£9.00
Chess	Gm	Program Power	12K	X	PR	£9.15
Constellation	Gm	Program Power	12K	C	PR	£7.99
Constellation	Gm	Program Power	12K	C	PR	£7.99
Colour Invaders	Gm	Hopesoft	12K	C	HO	£3.75
Cowboy Shootout	Gm	Program Power	12K	C	BR,PR	£7.99
Cylon Attack	Gm	A&F S/W	12K	C	AA	£4.95
Dambusters	Gm	Program Power	10K	C	PR	£5.69
Data Base	Ut	Acornsoft	6K	C	MIo,COu,EL	£11.50
Death Satelite	Gm	A&F S/W	12K	C	AA	£6.00
Demon Dungeon	Gm	Program Power	5K	C	PR	£6.85
Derby, Blitz and Rat Race	Gm	Program Power	12K	C	PR	£6.84
Desk Diary	Bs	Acornsoft	12K	C	MIo,COu,EL	£11.50
Detective	Gm	Computersmith	12K	C	CDm	£4.95
Disassembler	Ut	Hopesoft	3K	C	HO	£1.75
Disassemble Program	Ut	Program Power	4K	C	PR	£6.85
Dragon's Lair	Gm	Program Power	12K	C	PR	£6.85
Early Warning	Gm	A&F S/W	12K	C	AA	£4.95
Earth Rescue	Gm	Rucksoft	6K	C	R	£2.80
Easy Talker	Ed	Acornsoft	16K	C	AC	£5.00
Escape	Gm	A&F S/W	8K	C	AA	£4.95
Fall of Rome	Gm	Program Power	12K	C	PR	£7.99
Forth Tape	Ut	Acornsoft		C	COu	POA
Forth, Theory & Practice	Bs	Acornsoft		C	AC	£6.00
Galactica	Gm	Program Power	12K	C	PR	£5.69
Galaxian	Gm	Bug Byte	12K	C	BR,AN,EL	£8.00
Galaxian War and Invasion	Gm	Program Power	2K	C	PR	£6.84
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High Stats	Bs	Program Power	12K	C	PR	£7.99
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Pirate Island	Gm	Hopesoft	12K	C	HO	£6.75
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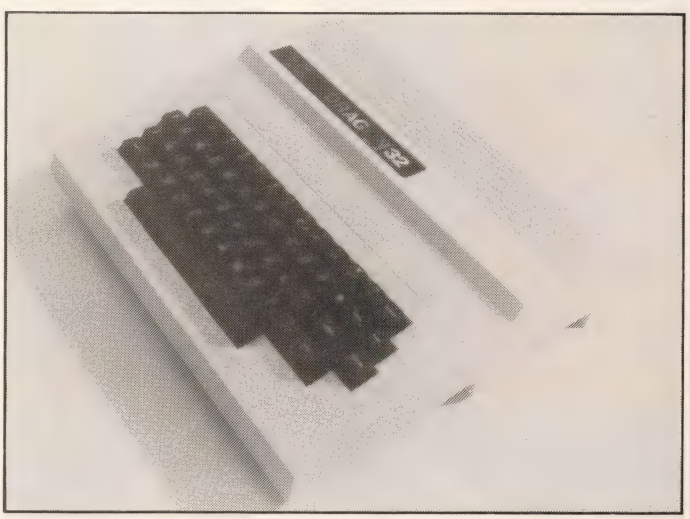

Program Pack 1	Gm	Microdeal	16K	C	KE	£8.00
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Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
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Alien Hell	Gm	Syncro	16K	C	CRs	£13.95
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Analog Adventure	Gm		32K	D	MA	£34.95
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Assembler Editor	Ut	Atari		R	MI,GE	£39.95
Assembler	Ut	Quality S/W	16K	C	MA	£14.95
Assembler Editor	Ut	United S/W of America	16K	R	MA	£34.50
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					GE,SI,BC	£18.95
Atari Word Processor	Bs	Atari	32K	C	MI	£95.95
Atari Word Processor	Bs	Atari	32K	C	MA	£85.00
Atari Word Processor	Bs	Atari	32K	D	GE	£99.95
Atari World Graphics	Ut	United S/W of America	48K	D	MA	£43.95
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					MI	£16.75
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Frogger	Gm	On Line	32K	D	TH	£22.95
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Galactic Chase	Gm	Spectrum	16K	D	MI	£20.25
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Galaxy	Gm	Avalon Hill	16K	D	AV	£14.95
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Hangman	Gm	Atari	16K	C	LA,MA MI,GE,SI	£8.95 £9.95
Hickory Dickory Dock	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Home Financial Mg'ment	Dm	Thorn EMI	16K	D	GE	£29.95
Horizontal/Vertical Scrolling	Ed	Santa Cruz	16K	C	MI	£13.95
House of Usher	Gm	Chrystal	48K	C	MI,BR,SI	£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Intruder Alert	Gm	Dinacomp	16K	C	MI,SI	£15.99
Invasion Orion	Gm	Avalon Hill		C	AN,SI	£13.25
Invasion Orion	Gm	Avalon Hill		D	AN,SI	£15.75
Invitation to Prog I	Ed	Atari	16K	C	MI,GE,SI	£15.95
Invitation to Prog. II	Ed	Atari	16K	C	CE,SI,MI MA,GE	POA £22.95
Invitation to Prog. III	Ed	Atari	16K	C	MI,MA,GE IK	£22.95
Nautilus	Gm	Synapse	32K	C	GE	£20.00
Nomino's Jigsaw	Gm	Dinacomp	24K	C	MI,SI	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	MI	£24.95
Nuke War	Gm	Avalon Hill	16K	C	AV	£10.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	MI	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	MA	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	CE MI	POA £16.75
Pacific Coast Highway	Gm	Datasoft	16K	C	TH	£20.00
Pacific Coast Highway	Gm	Datasoft	16K	D	TH	£20.00
Pac-Man	Gm	Atari	16K	R	CE,SI MA,GE	POA £29.95
Page Flipping	Ed	Santa Cruz	16K	C	MA	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	MA	£10.95
Personal Finance	Gm	Atari		R	MA	£49.00
Pilot (Educator)	Ut	Atari	16K	C/R	MI,MA,GE	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	MA MI,SI	£14.95 £16.50
Planet Miners	Gm	Avalon Hill	24K	C	AV	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	MA	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	MA,MI	£18.95 £19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	MA	£10.95
Program Pack I	Ut	Avalon HIll	16K	C	AN	£3.50
Protector	Gm	Synapse	32K	C	TH	£19.95
Purchase Ledger	Bs	Atari	48K	C	MI,SI	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	MA MI,SI	£14.95 £16.50
QS Forth	Ut	Quality S/W	24K	D	MA	£44.90
Quest for Power	Gm	Chrystal	48K	C	BR,MI	£26.99
Race in Space	Gm	Analog S/W	16K	C	MA	£14.95
Race in Space	Gm	Analog S/W	16K	C	TH	£15.95
Race in Space	Gm	Analog S/W	16K	D	TH	£15.95
Raster Blaster	Gm	Budgeco	32K	C	TH	£22.95
Rescue at Rigel	Gm		32K	C	MA,SI	£22.45
Reversi	Gm	Artsci Inc	16K	C	MA	£14.95
Rings of the Empire	Gm	Dinacomp	16K	C	MI,SI	£15.99
Rotate and Tilt	Gm	Thorn EMI	16K	C	MA,GE	£14.95
Sales Ledger	Bs	Atari	48K	C	MI,SI	149.95
Sands of Mars	Gm	Chrystal	48K	C	BR,MI,SI	£26.99
Savage Island I	Gm	Adventure Int.	24K	C	MA,SI	£14.95
Scram	Gm	Atari	16K	C	CE,SI MI,BR,GE	POA £17.50
Shooting Arcade	Gm	Datasoft	16K	C	GE	£20.00
Shooting Arcade	Gm	Datasoft	16K	D	GE	£20.00
Shooting Gallery	Gm	Analog S/W	16K	C	MA	£15.95
Shooting Gallery	Gm	Analog S/W	16K	D	MA	£15.95
Six Microstories	Gm	Adventure Int.	32K	C	MI	£12.50
Sky Warrior	Gm	Adventure Int.	16K	C	MI	£16.50
Snake Byte	Gm	Sirius Software	32K	D	CRs	£19.25
Snooker and Billards	Gm	Thorn EMI	16K	C	MA,GE,SI	£19.95
Sound Editor	Gm	Atari	16K	C	CE MI	POA £16.75
Sound Tutorial	Ed	Santa Cruz	16K	C	DA	£13.95
Space Ace	Gm	London S/W	16K	C	GE	£19.95
Space Ace	Gm	London S/W	16K	D	GE	£19.95
Space Invaders	Gm	Atari	16K	R	MI,BR,GE MA,SI	
Space Tilt	Gm	Dinacomp	16K	C	MA,SI	£29.95
Space Trap	Gm	Allrian	16K	C	AL	£15.50
Space Trap	Gm	Dinacomp	24K	C	MI,SI	£9.99
Space Trek	Gm	Atari	24K	C	HI CR	POA £13.50

SOFTWARE LISTING

ATARI

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Star Raiders	Gm	Atari	16K	R	GE,LA,MA BR,SI	£29.95
Star Trek 3.5	Gm	Adventure Int.	32K	C	MA	£14.95
					MI	£16.50
Star Warrior	Gm	Epyx	32K	C	MA,SI	£28.95
States and Capitals	Ed	Atari	16K	C	LA,MA,SI	£8.95
					MI,GE	£9.95
Statistics 1	Fm	Atari		C	LA,MA,SI	£11.95
Stock and Bonds	Gm	Avalon Hill	32K	C	AV	£12.95
Stone of Sisyphus	Gm	Adventure Int.	24K	C	AV	£12.95
Strange Odyssey	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
Stud Poker	Gm	Dinacomp	16K	C	MI,SI	£10.99
Stud Poker	Gm	Allrian	16K	C	AL	£14.00
Submarine Commander	Gm	Thorn EMI	16K	C	MA,GE,SI	£24.50
Summer	Gm	Chrystal	16K	C	MI	£11.99
Sunday Golf	Gm	Adventure Int.	16K	C	MI,SI	£16.50
Super Breakout	Gm	Atari	16K	C	LA,GE,SI	£24.50
Super Breakout	Gm	Atari	16K	R	MI,SI	£35,95
T:A Text Display Device	Do	Allrian	16K	C	AL	£16.00
Tack Trek	Gm	Atari	24K	C	CE	POA
					M	£13.50
Tank Trap	Gm	Quality S/W	16K	C	MA	£8.95
Tank Trap	Gm	Quality S/W	16K	D	MA	£11.95
Tanktics	Gm	Avalon Hill	32K	C	BR	£16.95
Tari Trek	Gm	Quality S/W	16K	C	MA	£8.95
Teachers Pet	Ed	Allrian	16K	C	AL	£14.00
Tari Trek	Gm	Quality S/W	16K	D	MA	£11.95
Tele Link	Gm	Atari	16K	R	GE,SI	£21.50
Tele Link	Ut	Atari	16K	R	MI,SI	£19.95
Telelink	Ut	Data Soft	16K	R	MA,SI	£14.95
Terrie	Gm	Atari	32K	C	CE	POA
					MI	£16.75
Text Editor	Bs	Allrian	32K	D	AL	£30.00
Text Wizard	Ut	Data Soft	16K	D	MI	£99.95
The Count	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
The Cranston Manor Adventure	Gm	Allrian	32K	D	AL	£30.00
The Vaults of Zurich	Gm	Allrian	24K	C	AL	£19.50
The Predictor	Bs	Allrian	32K	D	AL	£27.95
The Rings of the Empire	Gm	Allrian	16K	C	AL	£15.50
Threshold	Gm	On-Line	32K	C	GE,SI	£24.95
Thunder Island	Gm	Analog S/W	16K	C	MA	£10.95
Touch Typing	Ed	Atari	16K	C	LA,MA,SI	£14.95
					MI,GE	£15.95
Tournament Pool and 8 Ball Pool	Gm	Thorn EMI	16K	C	BR,MA,GE SI	£19.95
Track Attack	Gm	Broada Bond	32K	D	GE	£32.95
Triple Blockade	Gm	Dinacomp	16K	C	MI,SI	£12.99
Tumble Bugs	Gm	Datasoft	24K	D	GE	£19.95
Two Heads of the Coin	Gm	Adventure Int.	32K	C	MI	£16.50
Ulysses	Gm	On-Line	40K	D	GE	£24.95
Video Easel	Gm	Atari	16K	R	CE,SI	POA
					MI,MA,GE	£24.50
Visicalc	Bs	Personal S/W	32K	D	MA,SI	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	MA,SI	£14.95
					MI	£16.50
Voyager	Gm	Avalon Hill	32K	C	BR,AV	£12.95
Waterloo	Gm	Chrystal	48K	C	BR,SI	£32.99
Wizard and the Princess	Gm	On Line	48K	D	BR,SI	£22.95
World War III	Gm	Chrystal	48K	C	BR,MI,SI	£19.99

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Action of the Heart	Ed	Garland Comp.	32K	C	GA	£11.76
Adventure	Gm	Micro Power	32K	C	PRo	£6.95
Adventure	GM	Program Direct	32K	C	P	£5.99
Adventure Quest	Gm	Level 9 Computing	32K	C	LE	£9.90
Algebraic Manipulation	Ut	Acornsoft	16K	C	EL,AC	£9.95
Algebraic Manipulation	Ut	Acornsoft	32K	C	EL,AC	£9.95
Alien Destroyers	Gm	Micro Power	32K	C	PRo	£6.95
Alien Dropout	Gm	Superior Software	32K	C	SUp	£6.50
Arcade Action	Gm	Acornsoft	16K	C	EL	£11.90
Arrow of Death (1)	Gm	Digital Fantasia	16K	C	IJ	£6.95
Arrow of Death (2)	Gm	Digital Fantasia	16K	C	DI	£8.95
Airlift	Gm	Bug Byte	32K	C	LI	£5.50
Angle(4)	Ed	Chalksoft	32K	C	CHa	£6.95
Append It	Ut	Aztec S/W	16K	C	AZ	£3.00
Asteroids/Frong	Gm	Aardvark Software	16K	C	AAs	£4.00
Asteroid Belt	Gm	Electronics Appplied	32K	C	ELe	£11.50

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AA A&F Software
10 Wilpshire Avenue
Longsight
Manchester
061 320 5482

AAs Aardvark Software
15 Queensbury Avenue
Hartlepool
Cleveland
TS26 9NW

AB ABC Primary Software
19 Crumstone Court
Longmeadows Estate
Killingworth
Newcastle upon Tyne
NE12 0SZ

AC Acornsoft Ltd
4a Market Hill
Cambridge
CB2 3NJ
0223 316039

ALa A Lane (Software)
312/316 Seaside
Eastbourne
E Susex BN22 7RH

BRy Bryants (Educational) S/W
1 The Hollies
Chalcroft Lane
North Berstead
Bognor Regis
W Sussex PO21 5ZX

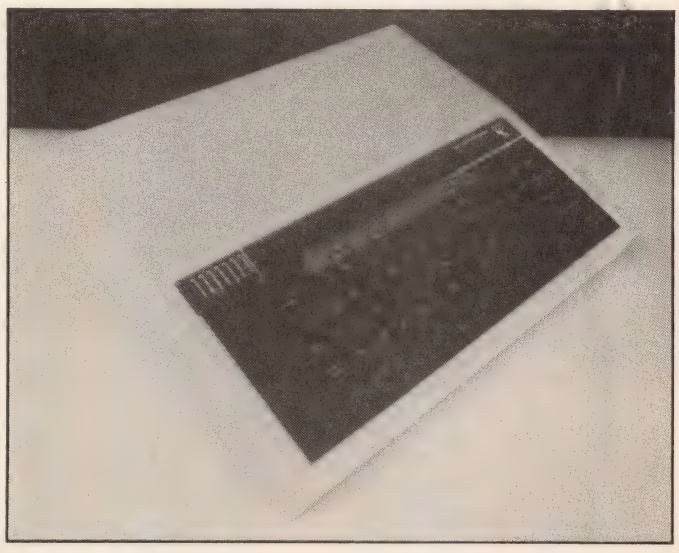
BU Bug-Byte
98-100 The Albany
Old Hall Street
Liverpool

CA Carswell Computers
Carswell Barn
Faringdon
Oxon SN7 8JN

CHa Chalksoft Ltd
Lowmoor Cottage
Tonedale
Wellington
Somerset TA21 0AL

CJ CJE Microcomputers
25 Henry Avenue
Rustington
W Sussex BN16 2PA

COc Computercat
224 Chapel Street
Leigh
Lancs
0942 605730



AN Anglia Computer Centre
88 St Benedict's Street
Norwich NR24 AB
0603 26002

ANi Anirog Computers
26 Balcombe Gardens
Horley
Sussex

AS ASP Software
145 Charing Cross Road
London WC2H 0EE
01 437 1002

AZ Aztec Software
25 St Marks Road
Deepcar
Sheffield S30 5TS

BB BBC Publications
The British Broadcasting Corporation
35 Marylebone High Street
London W1M 4AA

BR Bridge Software
36 Fernwood
Marple Bridge
Stockport SK6 5BE

COe Computer Concepts
16 Wayside
Chipperfield
Herts
09277 62955

COm Computersmith
40 Greensfields Avenue
Bromborough
Wirral L62 6DD

COr Corona Software
73 High Road
South Woodford
London

DAt Database
27 City Road
Stoke
Staffs

DAv Davansoft
1 Delapoer Drive
Haverfordwest
Dyfed SA61 1HX

DI Digital Fantasia
24 Norbreck Road
Norbreck
Blackpool
Lancs

Asteroid Belt	Gm	Computer Concepts	16K	C	COe	£7.80
Astro Navigator	Gm	Micro Power	32K	C	FO,PRo	£6.95
Atlantis	Gm	IJK Software	32K	C	IT	£6.95
Awari	Gm	Foilkade	16K	C	FO	£5.95
Backgammon	Ut	Bug Byte	32K	C	AN,LI	£8.00
Balloons	Gm	C J E Microcomputers	32K	C	CJ	£6.00
Basic Maths	Ed	Aztec S/W	16K	C	AZ	£3.00
Battlefield	Gm	Micro-Aid	32K	C	Mla	£2.50
Banner	Do	Micro-Aid	16K	C	Mla	£2.95
Beeb-Chase	Gm	Database Software	32K	C	DAt	£7.50
Beebmunch	Gm	I.J.K. S/W	32K	C	IJ	£5.95
Beebtrek	Gm	Software for All	16K	C	SO	£7.95
BEEP-BEEB	Gm	IJK	32K	C	IJ	£3.95
Bounty Pirates	Gm	Aztec S/W	16K	C	AZ	£5.50
Break-Up	Gm	Miking S/W	32K	C	Mlk	£3.95
Breakout	Gm	I.J.K. S/W	16K	C	IJ	£3.95
Breakout	Gm	Bryants S/W	32K	C	BRy	£3.75
Bridgeman	Gm	Bridge S/W	32K	C	BR	£7.90

Call Your Bluff	Gm	Square Software	16K	C	SQ	£6.00
Capitol Cities	Ed	Square Software	16K	C	SQ	£6.00
Carbohydrate Metabolism	Ed	Garland Comp.	32K	C	GA	£18.24
Cashbook A	Do	Micro-Aid	16K	C	Mla	£3.95
Cashbook B	Do	Micro-aid	16K	C	Mla	£3.95
Caves of Anoron	Gm	FBC Systems	32K	C	PRo	£7.00
Cat & Mouse	Gm	Micro Power	16K	C	PRo	£4.95
Cells and Serpents/ Stockmarket	Gm	ASP Software	16K	C	AS	£11.45
Cells & Serpent	Gm	Hexagon S/W	16K	C	HE	£5.00
Centipede	Gm	Superior S/W	32K	C	SUp	£7.00
CESCIL	Ed	Eduquest	16K	C	ED	£19.95
Character Builder	Ut	Davensoft	16K	C	DAv	£4.95
Characters	Ut	Computer Concepts	32K	C	COe	£6.67
Character Generator	Ut	MP S/W	32K	C	MP	£3.00
Character Generator	Ut	Software for All	32K	C	SO	£4.95
Characters	Ut	Computer Concepts	16K	C	COe	£6.67
Characters & Envelope Definer	Ut	Electronics Applied	32K	C	ELe	£5.50
Chess	Gm	Bug Byte	32K	C	AN	£11.50
Chess	Gm	Micro Power	32K	C	PRo	£6.95
Circus	Gm	Digital Fantasia	32K	C	DI	£8.95
Claws	Ed	Bryants S/W	16K	C	BRy	£3.75
Cards	Gm	Micro-Aid	16K	C	MP	£2.95
Cobra/Robo-Swamp	Gm	Software for All	16K	C	SO	£6.95
Cobra/Robo-Swamp	Gm	Software for All	32K	C	SO	£6.95
Code Race	Gm	Computer Concepts	16K	C	COe	£6.67
Code Race	Ut	Computer Concepts	32K	C	COe	£6.67
Colossal Adventure	Gm	Level 9 Computing	32K	C	LE	£9.90
Connect 4	Gm	Database Software	32K	C	DAt	£5.90
Constellation	Ed	Micro Power	32K	C	PRo	£5.95
Cookbook Wizardry	Do	Database Software	32K	C	DAt	£7.50
Cowboy Shoot-out	Gm	Micro Power	32K	C	PRo	£5.95
Creative Graphic Pack	Ut	Acornsoft	16K	C	EL,AC	£9.95
Creative Graphics	Ut	Acornsoft	32K	C	EL,AC	£9.95
Crossed Words	Ed	Aztec S/W	16K	C	AZ	£6.50

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EA Earthshock Software
15 Eden Avenue
Wakefield WF2 9DJ

ED Eduquest
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ELe Electronics Applied
4 Dromore Road
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BT38 7PJ

EL Eltec Services Ltd
231 Manningham Lane
Bradford BD8 7HH
0274 491372

FB FBC Systems Ltd
10 Castlefields
Main Centre
Derby
0332 365280

FO Foilkade Ltd
66 Littledean
Yate
Bristol BL17 4UQ

FU Futura Software
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GA Garland Computing
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GO Golem
77 Qualitas
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HE Hexagon Software
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W Midlands

HU Hutchinson Software
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IJ IJK Software
9 King Street
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JA James Hager
7 Basset Street
Cambourne
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LE Level 9 Computing
229 Hughenden Road
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LI Liverpool Computer Centre

LU Ludinski Computer-Assisted Learning
26 Avondale Avenue
Staines
Middlesex
0784 58771

MD Mayday Software
181 Portland Crescent
Stanmore
Middlx HA7 1LR

ME ME & P Micro Products
The Old Oast House
Malting Lane
Cambridge CB3 9HF

MEd MED
640 Melton Road
Thurmaston
Leicester LE4 8BB
0533 704492

Mla Micro-Aid
25 Fore Street
Praze-An-Beeble
Cornwall TR14 0JX

Mlm Micromail
PO Box 34
Leighton Buzzard LU7 8SJ

Mlk Miking Software
28 New Road
Northbourne
Bournemouth
BH10 7DS

MO Molimerx Ltd
1 Buckhurst Road
Town Hall Square
Bexhill on Sea
E Sussex
0424 220391

MP MP Software & Services
165 Spital Road
Bromborough
Wirral L62 2AE

ND N Darwood Ltd
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PE Persoft
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Baildon
Shipley
W Yorks BD17 6EQ

PD Program Direct
37B New Cavendish Street
London W1M 8JR

PRo Program Power
5 Wensley Road
Leeds LS7 2LX
0532 683186

PS Pro Software
121 Tyn-y-Twr
Baglan
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W Glamorgan SA12 8YE

SA Salamander Software
17 Norfolk Road
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W Sussex
0273 771942

SH Simon Hessel Software
15 Lytham Court
Cardwell Crescent
Sunninghill
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SO Software For All
72 North Street
Romford
0708-60725

SQ Square Software
12a Uplands Terrace
Swansea
W Glamorgan

SUp Superior Software
69 Leeds Road
Bramhope
Leeds
0532 842714

WI Wida Software
2 Nicholas Gardens
London W5 5HY
01 567 6941

SOFTWARE LISTING

BBC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Data-Quiz	Ut	Bryants S/W	32K	C	BRy	£4.88
Database	Bs	Computercat	16K	C	COc	£11.95
Database	Bs	Software for All	16K	C	SO	£9.95
Defchr	Ut	Micro-Aid	16K	C	MIa	£2.95
Defender	Gm	Acornsoft	32K	C	EL,AC	£9.95
Desk Diary	Bs	Acornsoft	32K	C	EL,AC	£9.95
Desk Diary	Bs	Acornsoft	16K	C	AC	£9.95
Devil's Causeway	Gm	Anirog Computers	16K	C	ANi	£6.00
Dissassembler	Ut	Micro Power	16K	C	PRo	£5.95
Dissassembler	Ut	Program Direct	16K	C	P	£3.00
Dissassembler	Ut	Davansoft	16K	C	DAv	£5.95
Dissassembler	Ut	C J E Microcomputers	16K	C	CJ	£5.00
Distances	Ed	Micro-Aid	32K	C	MIa	£2.95
Digital X-Word Compiler	Gm	N. Darwood	16K	C	ND	£6.00
DNA Replication	Ed	Garland Comp.	32K	C	GA	£17.65
Dragon Rider	Gm	Salamander Software	32K	C	SA	£6.95
Dragon Quest II	Gm	Bug Byte	32K	C	LI	£11.50
Dragon Quest	Gm	Bug Byte	32K	C	LI	£11.50
Drawing	Ut	B.B.C.	16K	C	BB	£10.00
Dungeon Adventure	Gm	Level 9 Computing	32K	C	LE	£9.90
Early Learning	Ed	B.B.C.	16K	C	BB	£10.00
Early Numbers	Ed	Bryants S/W	32K	C	BRy	£4.80
Early Warning	Gm	A&F Software	16K	C	AA	£6.00
Educational (1)	Ed	Golem	16K	C	GO	£8.05
Educational (2)	Ed	Golem	16K	C	GO	£8.05
7 Educational Games	Gm	Micromail	32K	C	MIm	£5.75
Eldorado Gold	Gm	Program Power	32K	C	PRo	£7.99
Electric	Ed	Database Software	16K	C	DAt	£5.50
European Studies	Ed	Aztec S/W	32K	C	AZ	£6.50
Escape from Pulsar 7	Gm	Digital Fantasia	32K	C	DI	£8.95
Fairytale	Gm	Molimerx	32K	C	MO	£10.06
Feasibility Experiment	Gm	Ditigal Fantasia	32K	C	DI	£8.95
Filer	Bs	Micro Power	16K	C	PRo	£8.95
Firien Wood	Gm	MP S/W	32K	C	MP	£6.50
Flags	Ed	Micro-Aid	16K	C	MIa	£2.95
Flush	Ut	Micro-Aid	16K	C	MIa	£1.00
Football Pools Predictor	Do	Mayday Software	16K	C	MD	£4.99
Footer	Gm	Micro Power	32K	C	PRo	£6.95
Frenzy	Gm	Persoft	16K	C	PE	£5.75
Frogger (Machine Code)	Gm	A&F Software	32K	C	AA	£8.00
Fruit Machine	Gm	Superior Software	32K	C	SUp	£6.50
Fruit Machine	Gm	Bug Byte	32K	C	BU	£5.50
FORTH	Ut	Acornsoft	32K	C	AC	£16.85
Fun Games	Gm	B.B.C.	16K	C	BB	£10.00
Galactic Commander	Gm	Micro Power	32K	C	PRo	£6.95
Games Pack 1	Gm	Computersmith	16K	C	COm	£5.50
Galaxians	Gm	Superior S/W	32K	C	SUp	£7.00
Game of Logic	Ed	N. Darwood	16K	C	ND	£8.00
Games of Logic and cunning	Gm	Golem	16K	C	GO	£9.20
Games of Strategy	Gm	B.B.C.	16K	C	BB	£10.00
Games Pack II	Gm	Micromail	32K	C	MIm	£6.75
Genetic Code	Ed	Garland Comp.	32K	C	GA	£17.65
Geography Italy	Ed	Corona S/W	32K	C	COr	£5.00
Ghost/Diamonds	Gm	A Lane	16K	C	ALa	£3.00
Ghost Maze	GM	Software for All	32K	C	SO	£6.95
Grand Prix	Gm	Software for All	32K	C	SO	£5.95
Golf	Gm	Bryants S/W	32K	C	BRy	£4.88
Golf	Gm	Bug Byte	32K	C	BU	£7.00
Golf	Gm	Computersmith	32K	C	COm	£5.50
Gomoku	Gm	Micro Power	16K	C	PRo	£3.95
Graphics Package	Ut	Salamander Software	32K	C	SA	£24.95
Graph and Charts Pack	Bs	Acornsoft	32K	C	AC	£9.95
Graph and Charts Pack	Bs	Acornsoft	16K	C	AC	£9.95
Great Britain Ltd	Gm	S.W. Hessel S/W	32K	C	SH	£5.95
Guzzler	Gm	Computersmith	32K	C	COm	£5.50
Hangman	Gm	Aztec S/W	16K	C	AZ	£5.50
Hangman	Gm	MP S/W	32K	C	MP	£4.00
Helicopter Rescue/Tunnel/ Roadrace	Gm	A Lane	16K	C	ALa	£4.00
Home Accounts	Do	Persoft	32K	C	PE	£12.50
Home Finance	Do	B.B.C.	16K	C	BB	£10.00
Hydraulics	Ed	Database Software	16K	C	DAt	£5.50
Inkosi	Gm	Chalksoft	32K	C	CHa	£5.95
Invaders	Gm	Superior S/W	32K	C	SUp	£7.00
Invaders	Gm	Software for All	16K	C	SO	£6.95
Invaders	Gm	Hexagon S/W	16K	C	HE	£6.00
Invaders	Gm	MP S/W	32K	C	MP	£6.50
Invisible Man	Ed	Chalksoft	32K	C	CHa	£5.95
Inheritance	Gm	S.W. Hessel S/W	32K	C	SH	£5.95
Inheritance	Ed	Garland Comp.	32K	C	GA	£34.70
J.R.	Gm	Software for All	32K	C	SO	£6.95
Jumbles	Ed	Bryants S/W	32K	C	BRy	£4.88
Jumbo	Gm	Molimerx	32K	C	MO	£17.25
Junior Maths Pack	Ed	Micro Power	32K	C	PRo	£5.95
Katakombs	Gm	Golem	32K	C	GO	£9.20
La Princesse (French)	Ed	Aztec S/W	32K	C	AZ	£6.50
Landfall & Serpent	Gm	GT Software	32K	C	GT	£6.50
Laser Command	Gm	Micro Power	32K	C	PRo	£6.95
Letters	Ed	Chalksoft	32K	C	Cha	£6.95
Library Dewey Classification	Ed	Aztec S/W	32K	C	AZ	£6.50
Link-4-Plus	Gm	ABC Software	16K	C	AB	£6.95
Lisp	Ut	Acornsoft	32K	C	AC	£16.85
Lisp	Ut	Acornsoft	16K	C	AC	£16.85
Logo 2	Ut	Computer Concepts	32K	C	COe	£10.00
Lunar Lander	Gm	A&F Software	32K	C	AA	£6.90
Mailing A	Bs	Micro-aid	16K	C	MIa	£3.95
Mailing B	Bs	Micro-Aid	16K	C	MIa	£3.95
Martians	Gm	Micro Power	32K	C	PRo	£5.95
Mastermind	Gm	Micro Power	16K	C	PRo	£3.95
Maze Invaders	Gm	Micro Power	32K	C	PRo	£4.95
Maze Man	Gm	C J E Microcomputers	32K	C	CJ	£6.00
Micro Budget	Do	Micro Power	16K	C	PRo	£6.95
Metrics (5)	Ed	Chalksoft	32K	C	CHa	£9.95
Micro Maths	Ed	LCL	16K	C	LU	£24.50
Minefield	Gm	Eduquest	16K	C	ED	£5.95
Master Copier	Ut	Aztec S/W	16K	C	AZ	£6.50
Maths Translation	Ed	Corona S/W	32K	C	COr	£5.00
Micro-Derby	Gm	Bug Byte	32K	C	BU	£5.50
Micro Man	Gm	Pro S/W	32K	C	PS	£8.00
Middle Kingdom	Gm	Pro S/W	16K	C	PS	£8.00
Minefield	Gm	A&F Software	16K	C	AA	£6.00
Missile Control	Gm	C J E Microcomputers	32K	C	CJ	£9.00
Mission Impossible	Gm	Aztec S/W	16K	C	AZ	£6.50
Mixed Games	Gm	I.J.K. S/W	16K	C	IJ	£3.95
Model A Invaders	Gm	I.J.K. S/W	16K	C	IJ	£4.95
Model B Invaders	Gm	I.J.K. S/W	32K	C	IJ	£6.95
Money Box	Ed	Bryants S/W	32K	C	BRy	£4.88
Monsters	Gm	Acornsoft	32K	C	AC	£9.95
Monster Battles	Gm	Bryants S/W	32K	C	BRy	£4.80
Multifile	Bs	Bug Byte	16K	C	BU	£25.00
Multiple Choice	Ed	Eduquest	32K	C	ED	£25.00
Munchyman	Gm	Micro Power	16K	C	PRo	£5.95
Music	Do	B.B.C.	16K	C	BB	£10.00
Musical Numbers	Ed	Bryants S/W	32K	C	BRy	£4.88
Musical Number Box	Gm	Bryants S/W	16K	C	BRy	£3.75
Music Program	Do	Golem	32K	C	GO	£6.90
Mutant Invaders	Gm	I.J.K. S/W	16K	C	IJ	£5.95
MX 80 Type 3 Screen Dump	Ut	Software for All	16K	C	SO	£6.95
Othello	Gm	Computer Concepts	16K	C	COe	£8.95
Othello	Gm	Computer Concepts	32K	C	COe	£8.95
Othello	Gm	Computercat	16K	C	COc	£8.95
Parity	Ed	N. Darwood	16K	C	ND	£6.00
Payroll	Bs	Micro-Aid	32K	C	MIa	£5.95

Payroll 2	Bs	Micro-Aid	32K	C	MIa	£5.95
Peeko Computer	Bs	Acornsoft	16K	C	AC	£9.95
Pete the Plastered Postman/ Asteroid Lander	Gm	ASP Software	16K	C	AS	£8.50
Pharoah's Tomb	Gm	A&F Software	32K	C	AA	£8.00
Philosopher's Quest	Gm	Acornsoft	16K	C	AC	£9.95
Picsave	Ut	Hexagon S/W	16K	C	HE	£6.00
Painting	Ut	B.B.C.	16K	C	BB	£10.00
Peeko Computer	Ut	Acornsoft	32K	C	AC	£9.95
Procflush	Ut	Micro-Aid	16K	C	MIa	£1.00
Powerboat Race	Gm	Futura S/W	32K	C	FU	£7.95
Polaris	Gm	Bug Byte	32K	C	BU	£5.50
Procvar	Ut	Micro-Aid	16K	C	MIa	£1.95
Princess	Gm	Aztec S/W	16K	C	AZ	£6.50
Punctuation	Ed	Bryants S/W	32K	C	BRy	£4.88
Reversi & Gomuko	Gm	Pro S/W	16K	C	PS	£8.00
Reversi 1	Gm	Micro Power	16K	C	PRo	£4.95
Reversi 2	Gm	Micro Power	32K	C	PRo	£4.95
Road Runner	Gm	A&F Software	32K	C	AF	£6.90
Robot	Gm	Miking S/W	32K	C	MIk	£4.95
Roulette	Gm	Micro Power	32K	C	PRo	£4.95
Searchbas	Ut	Micro-Aid	16K	C	MIa	£1.95
Seed Germination	Ed	Garland Comp.	32K	C	GA	£18.82
Sequences	Ed	Chalksoft	32K	C	CHa	£5.95
Sheepdog Trials	Ed	Bryants S/W	32K	C	BRy	£4.80
Shootout	Gm	MP S/W	32K	C	MP	£5.00
Skwosh	Gm	Miking S/W	32K	C	MIk	£3.95
Snake	Gm	Computer Concepts	32K	C	COe	£6.67
Snapper	Gm	Acornsoft	32K	C	AC	£9.95
Sort M/C	Ut	Micro-Aid	16K	C	MIc	£1.00
Sortbas	Ut	Micro-Aid	16K	C	MIc	£1.00
Soundplan	Ut	ME & P Products	16K	C	ME	£10.00
Spacehawks	Gm	Computer Concepts	32K	C	COe	£7.80
Spacemaze	Gm	Micro Power	32K	C	PRo	£5.95
Spacefight	Gm	Miking S/W	32K	C	MIk	£7.95
Space Adventure	Gm	Pro S/W	32K	C	PS	£8.00
Space Warp	Gm	Bug Byte	32K	C	BU	£11.50
Space Fighter	Gm	MP S/W	32K	C	MP	£8.50
Space Fighter	Gm	Superior S/W	32K	C	SUp	£7.00
Space Games Pack 1	Gm	Futura S/W	16K	C	FU	£3.99
Space Games Pack 2	Gm	Futura S/W	16K	C	FU	£3.99
Space Games Pack 3	Gm	Futura S/W	16K	C	FU	£4.99
Space Games Pack 4	Gm	Futura S/W	16K	C	FU	£4.99
Space Invaders	Gm	Pro S/W	16K	C	PS	£8.00
Space Trek	Gm	Program Direct	32K	C	P	£5.99
Space Pirates	Gm	Bug Byte	16K	C	BU	£8.00
Speechparts	Ed	Bryants S/W	32K	C	BRy	£4.88
Squash	Gm	Aztec S/W	16K	C	AZ	£5.50
Star Maze	Gm	Database Software	32K	C	DA	£7.50
Star Trek	Gm	Micro Power	16K	C	PRo	£4.95
Startrek/Candy Floss	Gm	I.J.K. S/W	16K	C	IJ	£5.95
Star Treck	Gm	Hexagon S/W	16K	C	HE	£5.50
Statpack	Ed	Micro-Aid	32K	C	MIa	£7.95
Stats 1	Bs	ME & P Products	16K	C	ME	£15.00
Storybuilder	Ed	Bryants S/W	32K	C	PRo	£4.88
Superlife	Gm	Golem	32K	C	GO	£9.20
Super Hangman	Gm	I.J.K. S/W	32K	C	IJ	£3.95
Swamp Monsters	Gm	M P Software	32K	C	MP	£6.50
Swoop	Gm	Micro Power	32K	C	PRo	£6.95
Tables Test	Ed	Bryants S/W	32K	C	BRy	£4.88
Tape Copy	Ut	Davansoft	16K	C	DAv	£7.50
Teacher's Toolkit	Ed	Wida Software	32K	C	WI	£30.00
Text Processing Pack	Bs	Eduquest	32K	C	ED	£10.00
The Frog	Gm	James Hager	32K	C	JA	£6.50
The Golden Baton	Gm	Digital Fantasia	16K	C	DI	£8.95
3D Maze	Gm	I.J.K. S/W	32K	C	IJ	£3.95
The Time Machine	Gm	Digital Fantashia	16K	C	DI	£8.95
Timetrek	Gm	Micro Power	32K	C	PRo	£6.95
Touch Typist	Ed	Computercat	16K	C	COc	£9.95
Tower of Alos	Gm	A&F Software	16K	C	AA	£6.90
Towns of Britain	Ed	Aztec S/W	16K	C	AZ	£6.50
The Computer Programme Programs Vol 2	Do	B.B.C	32K	C	BB	£10.00
The Computer Programme Programs Vol 1	Do	B.B.C.	16K	C	BB	£10.00
Threed OXO	Gm	Micro-Aid	16K	C	Mia	£2.50
3-D Maze	Gm	Hexagon S/W	16K	C	HE	£6.00
3D Maze	Gm	Earthshock S/W	16K	L	EA	£3.00
Utilities	Ut	Golem	16K	C	GO	£8.05
Utilities	Ut	Micro-Aid	16K	C	MIa	£4.95
Valley	Gm	ASP Software	32K	C	AS	£11.45
Varkman/Meanies	Gm	Aardvark Software	16K	C	AAs	£4.00
Vogon Attack	Gm	Micromail	32K	C	MIm	£6.33
Water Relations of Plant Cells	Ed	Garland Comp.	32K	C	GA	£18.82
What's my number	Gm	Square Software	16K	C	SQ	£6.00
Where?	Ed	Micro Power	32K	C	PRo	£5.95
White Barrows Conquering Everest	Gm	ASP Software	16K	C	AS	£11.45
Wordwise	Gm	Computer Concepts	32K	C	COe	£74.75
Word Processor	Bs	Pro S/W	32K	C	PS	£19.95
Wordy	Gm	Square Software	16K	C	SQ	£6.00
World Geography	Ed	Micro Power	32K	C	PRo	£5.95
Zombies	Gm	Micro Power	16K	C	PRo	£3.95

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Alcatraz II	Gm	Spectral Assoc	16K	C	MD	£8.95
Artillery	Gm	Spectral Assoc	16K	C	MD	£7.95
Battlefleet	Gm	Spectral Assoc	16K	C	MD	£13.95
Black Sanctum	Gm	Mark Data Prods.	16K	C	MD	£17.50
Bugoutc Monitor	Ut	Spectral Assoc	4K	C	MD	£19.95
Calixto Island	Gm	Mark Data Prods.	16K	C	MD	£17.50
Cave Hunter	Gm	Mark Data Prods.	16K	C	MD	£19.95
Chromasette	Gm	Cload Inc	16K	C	MD	£5.95
Color Beserk	Gm	Mark Data Prods.	16K	C	MD	£19.95
Colour Invaders	Gm	Spectral Assoc	16K	C	MD	£19.95
Compuvoice	Ut	Spectral Assoc	16K	C	MD	£44.95
Croid	Gm	Spectral Assoc	16K	C	MD	£11.95
Editor Assembler	Ut	Spectral Assoc	16K	C	MD	£34.95
Game Of Life	Gm	Spectral Assoc	16K	C	MD	£13.95
Graphic Animator	Gm	Spectral Assoc	4K	C	MD	£9.95
Laser Command	Gm	Spectral Assoc	16K	C	MD	£9.95
Lothars Labyrinth	Gm	Spectral Assoc	16K	C	MD	£13.95
Madness & Minotaur	Gm	Spectral Assoc	16K	C	MD	£17.95
Magic Box	Ut	Spectral Assoc	16K	C	MD	£24.95
Magikube	Gm	Computer Ware	16K	C	MD	£17.50
Mazerace	Gm	Computer Ware	16K	C	MD	£14.95
Meteoroids	Gm	Spectral Assoc	16K	C	MD	£19.95
Scarfman	Gm	Cornsoft	4K	C	MD	£11.95
Secs	Ut	Datasoft	16K	C	MD	£19.95
Sigmon	Ut	Datasoft	16K	C	MD	£19.95
Sound Source	Ut	Spectral Assoc	16K	C	MD	£24.95
Space Traders	Gm	Spectral Assoc	16K	C	MD	£13.95
Space War	Gm	Spectral Assoc	16K	C	MD	£19.95
Storm	Gm	Computer Ware	16K	C	MD	£19.95
Sub Hunt	Gm	Spectral Assoc	16K	C	MD	£13.95
3D Drawing Board	Gm	Computer Ware	16K	C	MD	£19.95
Typing Teacher	Gm	Spectral Assoc	16K	C	MD	£19.95
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SOFTWARE LISTING

TEXAS

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3D O's and X's/Mastermind	Gm	Apex S/W	16K	C	AP	£4.95
A-Maz-Ing	Gm	Texas	8K	R	BR	£24.00
Addition, Subtraction I	Ed	Texas	8K	R	MI,BR	£35.00
Addition, Subtraction II	Ed	Texas	8K	R	BR	£35.00
Attack	Gm	Texas	8K	R	BR	£30.00
Adventure Land	Gm	Texas	8K	C	BR	£24.95
Battlefront	Gm	TX Software	16K	C	TX	£6.00
Beginning Grammar	Ed	Texas	8K	R	BR	£20.00
Blackjack Poker	Gm	Texas	8K	R	BR	£24.00
Blasto	Gm	Texas	8K	R	BR	£25.00
Car Wars	Gm	Texas	8K	R	BR,MI	£25.00
Chequebook Manager	Bs	Texas Max	16K	D	BR	£19.00
Chess File	Gm	TX Software	16K	C	TX	£6.00
Connect 4	Gm	Texas	8K	R	BR	£24.00
Early Reading	Ed	Texas	8K	R	BR	£35.00
Editor Assembler	Ut	Texas	8K	R	BR	£115.00
Electrical Eng'g Library	Bs	Texas Max	16K	C	BR	£24.00
Electrical Eng'g Library	Bs	Texas Max	16K	D	BR	£35.00
Extended Basic	Bs	Texas	8K	R	BR	£100.00
Four in a Row	Gm	TX Software	16K	C	TX	£6.00
Gamestape 1	Gm	Apex S/W	16K	C	AP	£1.95
Gamestape 2	Gm	Apex S/W	16K	C	AP	£3.95
Gamestape 3	Gm	Apex S/W	16K	C	AP	£4.95
Ghost Town	Gm	Texas	8K	C	BR	£24.95
Golden Voyage	Gm	Texas	8K	BR	AB	£24.95
Golf	Gm	TX Software	16K	C	TX	£6.00
Graphing Package	Do	Texas Max	16K	C	BR	£14.00
Graphing Package	Do	Texas Max	16K	D	BR	£19.00
Hangman	Gm	Texas	8K	R	BR	£24.00
Haunted House	Gm	Apex S/W	16K	C	AP	£5.95
Household Money Management	Do	Texas	8K	R	BR	£25.00
Hunt The Wumpus	Gm	Texas	8K	R	BR,MI	£25.00
Hustle	Gm	Texas	8K	R	BR	£30.00
Lunar Lander	Gm	Apex S/W	16K	C	AP	£4.95
Mailing List	Bs	Texas Max	16K	D	BR	£60.00
Market Simulation	Bs	Texas	32K	C	BR	£9.00
Market Simulation	Bs	Texas	32K	D	BR	£19.00
Maths Routine Library	Ed	Texas Max	16K	C	BR	£24.00
Maths Routine Library	Ed	Texas Max	16K	D	BR	£35.00
Maze/Towers of Hanoi	Gm	Apex S/W	16K	C	AP	£5.95
Mind Challenges	Gm	Texas	16K	R	BR	£24.95
Minimemory	Ut	Texas	8K	R	MI	£89.95
Mission Impossible	Gm	Texas	8K	C	MI	£24.95
Multiplication	Ed	Texas	8K	R	MI	£35.00
Munchman	Gm	Texas	8K	R	MI	£29.95
Music Makers	Do	Texas	8K	R	MI	£35.00
Music Maker	Ed	Texas	16K	D	MI	£14.00
Music Skills Trainer	Ed	Texas Max	16K	C	MI	£19.00
Music Skills Trainer	Ed	Texas Max	16K	D	MI	£24.00
Mystery Funhouse	Gm	Texas	8K	C	MI	£24.95
Nim/O's and X's	Gm	Apex S/W	16K	C	AP	£4.95
Number Magic	Ed	Texas	8K	R	MI	£18.00
Oldies but Goodies	Gm	Texas Max	16K	C	MI	£9.00
Oldies but Goodies	Gm	Texas Max	16K	D	MI	£14.00
Othello	Gm	Texas	8K	R	MI	£40.00
Personal Financial Aid	Do	Texas	8K	C	MI	£9.95
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Personal Report Generator	Do	Texas	8K	R	MI	£70.00
Physical Fitness	Do	Texas	8K	R	MI	£20.00
Pirate Adventure	Gm	Texas	8K	R	MI	£39.95
Pre-School Learning Fun	Ed	Texas	8K	R	MI	£17.00
Programming Aids I	Ut	Texas	16K	C	MI	£9.00
Programming Aids I	Ut	Texas	16K	D	MI	£14.00
Programming Aids II	Ut	Texas	16K	D	MI	£24.00
Programming Aids III	Ut	Texas	16K	D	MI	£19.00
Pyramid of Doom	Gm	Texas	8K	C	MI	£24.95
Roulette/Craps	Gm	Apex S/W	16K	C	AP	£4.95
Savage Island I	Gm	Texas	8K	C	MI	£29.95
Savage Island II	Gm	Texas	8K	C	MI	£29.95
Saturday Night Bingo	Gm	Texas Max	16k	C	MI	£14.00
Soccer	Gm	Texas	8K	R	MI,BR	£30.00
Sorcerers Castle	Gm	Apex S/W	16K	C	BR	£5.95
Speech Editor	Ut	Texas	8K	R	AP	£35.00
Statistics	Do	Texas	8K	R	MI	£45.00
Strange Odyssey	Gm	Texas	8K	C	MI	£24.95
Structural Eng'g Library	Bs	Texas	16	C	MI	£24.00
Structural Eng'g Library	Bs	Texas Max	16K	D	MI	£35.00
TI Logo	Ut	Texas	48K	R	MI	£160.00
TI Invaders	Gm	Texas	8K	R	MI,BR	£40.00
TI Trek	Gm	Texas Max	16K	D	MI	£14.00
Teach Yourself Extended Basic	Ed	Texas	32K	C	MI	£20.00
Teach Yourself Extended Basic	Ed	Texas	32K	D	MI	£29.00
Teach Yourself Basic	Ed	Texas	32K	C	MI	£30.00
Teach Yourself Basic	Ed	Texas	32K	D	MI	£40.00
Terminal Emulator	Ut	Texas	8K	R	MI	£57.00
The Count	Gm	Texas	8K	C	MI	£24.95
Tombstone City	Gm	Texas	8K	R	MI,BR	£40.00
Tunnels of Doom	Gm	Texas	8K	R	MI,BR	£40.00
UCSD PASCAL 4	Ut	Texas	48K	D	MI	£380.00
US Football	Gm	Texas	8K	R	MI	£24.00
Video Chess	Gm	Texas	8K	R	MI,BR	£50.00
Video Games I	Gm	Texas	8K	R	MI,BR	£25.00
Video Games II	Gm	Texas	8K	R	MI	£25.00
Voodoo Castle	Gm	Texas	8K	C	MI	£24.95
Yahtzee	Gm	Texas	8K	R	MI	£30.00
Zero Zap	Gm	Texas	8K	R	MI	£24.00

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AP Apex Trading Ltd
115 Crescent Drive South
Brighton
BN2 6SB

BR Brighton Gamer
24 Gloucester Road
Brighton
Sussex
0273 698424

CHi Childsplay Software
8 Vyner Grove
Ashton on Mersey
Sale M33 5GR
061 973 4302

MI Micro & Video Palace
62-64 Kensington High Street
London W8
01 937 8587

MIf Mik-Soft
132 High Street
Kempson
Bedford
MK41 7BN
0234 852045

RU Rumbelows Shops
Nationwide

TX TX Software
109 Abbotswold
Harlow
Essex
CM18 6TQ

VIC 20

3-D Maze	Gm	Adcom	8K	C	MI	£7.50
3-D Maze	Gm	Hi-Tech	3K	C	SU,Slg	£8.30
					XI	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C	MIc	£6.99
Alpha Blaster	Gm	Sumlock	5K	C	SUm	£7.95
Alien	Gm	Commodore	3K	R	SU,MI,SR, Slg, CAd, BR COa,TW,MIc	£19.95
Alien Attack	Gm	Adcom	5K	C	MI	£7.00
Alien Attack	Gm	Hi-Tech	3K	C	XI,Slg	£8.62
Alien Blaster	Gm	Paysoft	5K	C	TW	£5.25
Alien Blaster	Gm	MAC	3K	C	MOr	£5.50
Alien Blitz	Gm	Audiogenic	3K	C	MIc,GE	£7.99
Alien Blitz	Gm	Audiogenic	5K	C	BR	£7.99
Alien Maze	Gm	Adcom	8K	C	MI	£7.50
Alien Maze	Gm	Hi-Tech	3K	C	SU,Slg, XI	£8.30 £8.62
Alien Invasion	Gm	Computermat	3K	C	AVo	£8.95
Alien Wars	Gm	Hi-Tech	3K	C	SU,MIr, XI Slg	£8.30 £7.80 £8.62
Amok	Gm	Audiogenic	5K	C	MIc,GE	£6.99
Ant Raiders	Gm	PR Software	3K	C	TH PRs	£7.95 £7.50
Asteroid Belt	Gm	Adcom	8K	C	MI	£7.50
Asteroid Belt	Gm	Hi-Tech	3K	C	Slg,XI	£8.62
Asteroid Blitz	Gm	Mossoft	3K	C	MOs	£6.00
Asteroids	Gm	Bug Byte	5K	C	TH	£8.99
Astro Fighters	Gm	Sumlock	5K	C	SUm	£6.95
At the Circus	Gm	Sumlock	5K	C	SUm	£5.95
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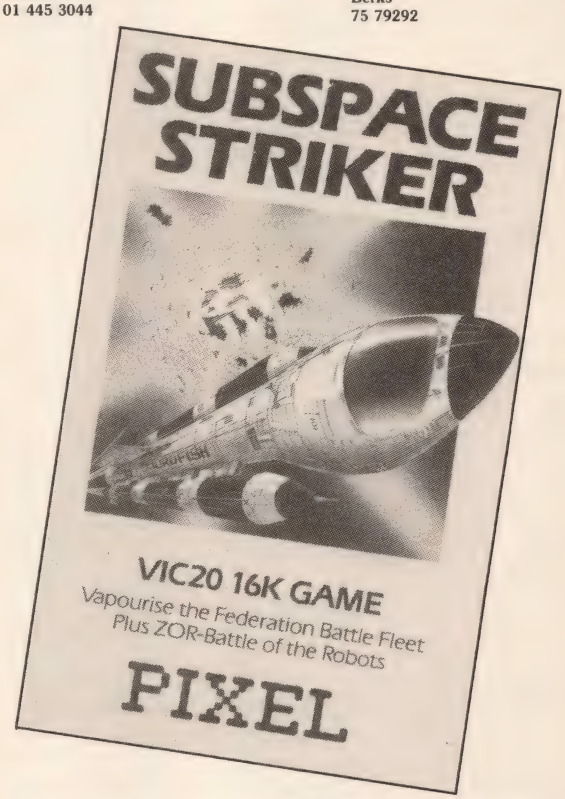

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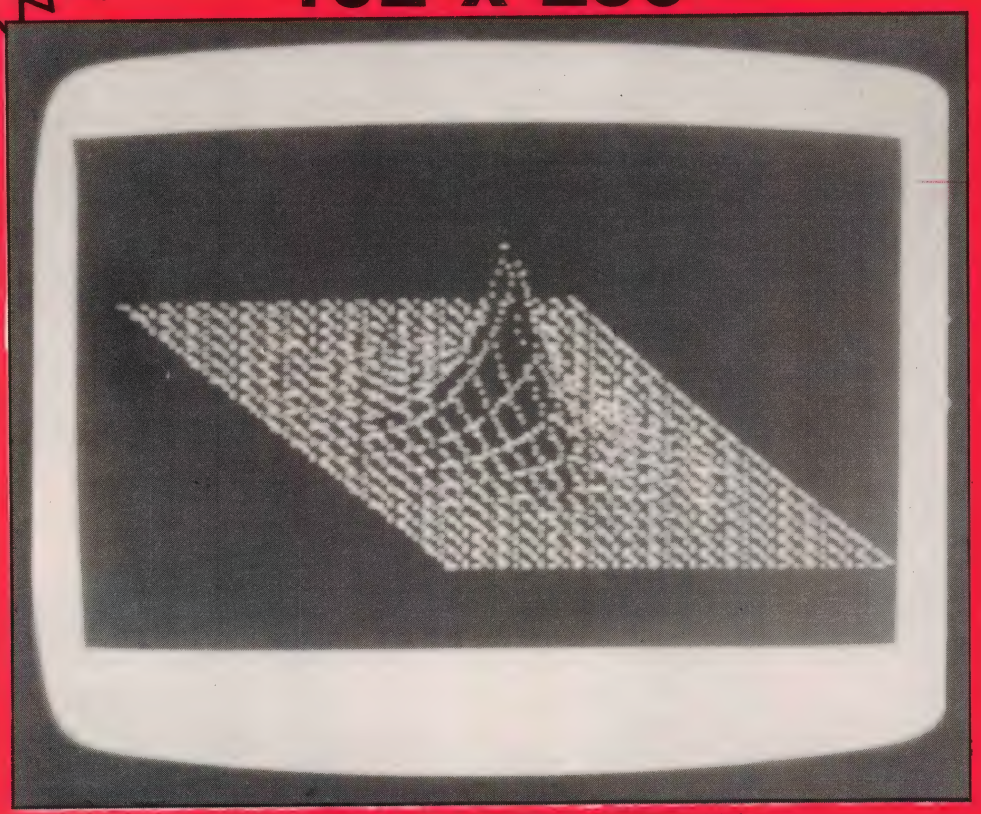

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MICROTERMS

Address
A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

Array
A special variable that is used to hold large amounts of string or numeric information in a row and column format.

Assembly Language
Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC
Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit
A single *binary* digit, representing either a 'one' or a 'zero'.

Bug
An error in *software*.

Byte
A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

Cartridge
A self-contained unit storing either ROM or RAM which plugs into a computer to expand the memory or provide a program.

Character Set
The list of letters, numbers and symbols that you can use to write programs and display information.

CP/M
A standard disc operating system that in theory allows software packages to be run on different machines. It stands for Control Program for Microcomputers.

Cursor
Character or graphic symbol used by the computer to denote where it's printing. Also used as a prompt to input information or a command.

Data
Simply, information. The raw material that the computer processes.

Debug
To correct the errors in a *program*.

Disc
Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 *megabytes* or more; a smaller *floppy disc* typically holds from 80 to 250 *kilo* bytes but in either case the capacity is being increased all the time.

Display Mode
Means of indicating the form in which the computer's output will appear on the *VDU* screen. It is either text only, text and graphics or graphics only. The display mode is usually represented by a number and the difference between these numbers indicates the change in the display capabilities of the screen, for instance on the BBC computer Mode O gives a higher resolution than Mode 1.

DOS
Disc Operating System. This refers to the piece of computer code that controls the action of the disc drive. On some machines this code has to be loaded into the machines memory and on others it is present in the *ROM* onboard the disc drive. The DOS tells the disc drive how to load and save programs on the disc as well as carrying out any disc management functions such as updating the directory.

Dummy Variable
This is a variable that is defined at the beginning of a program that has no use until later on in the program.

EPROM
Erasable Programmable Read Only Memory. When programming, writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Get
A BASIC command. It tells the computer to search the keyboard and bring back the value of the first key pressed.

Gosub
A BASIC command telling the computer to go to a subroutine within a program.

Gcol
A colour command used in BBC Basic.

Hard Copy
A computer printout or listing on paper.

Hardware
All the electronic and mechanical components making up a computer system.

Hex
Shortened version of hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

High Resolution
This means that you can pinpoint one dot on a screen rather than one square, giving you graphical pictures of much greater detail and accuracy.

Instruction
A set of *bits* which causes the *CPU* to carry out a particular task in a program.

Interface
Circuit which connects different parts of a system together and performs any processing of signals in order to make transfer possible (ie serial-parallel conversion).

I/O
Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — *peripheral* devices such as a *keyboard*, video display *(VDU)*, *printer* etc. An I/O port may be just an input or just an output or it can be bidirectional.

Kilo (K)
Normally means 1000, but stands for1024 (2^{10}) when referring to memory.

Language
A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute.

Location
Physical position; *memory* location is the same as *address*.

Loop
Program technique where one section of program (the loop) is performed many times over.

Machine Language (or Code)
The lowest (and most tediously detailed)

level of *program instructions*. All higher level coding must be converted to *machine language* (by *compiler* or *interpreter)* before a *processor* can obey it.

Memory Map
Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

Menu
A set of options displayed on-screen by a computer program from which the computer user can make a selection to implement.

Modulator
A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display.

Monitor
(1) The first level of computer *operating systems:* the *program* which turns *machine code* commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle video signals from a computer that does not have a *modulator*.

Parallel / Serial
Denotes the manner in which the computer's output is sent to its peripheral devices. Serial means that the information is passed out one byte after another and it uses a system of special characters to signify control codes of the device. Parallel communications are sent out along a series of wires using the high or low state of the wire to indicate which bits are set and therefore making up a byte.

Pascal
A very powerful, structured computer language, available on a variety of microcomputers.

Peek
This BASIC command reads a value from a location in the computer memory. It can be used to access either RAM or ROM.

Peripheral
Device attached to a computer, eg *printer, plotter, disc* unit, but not necessarily essential to its use.

Pixel
The single dot that is used to create characters displayed on the VDU. Also the smallest display unit when using high resolution graphics.

Poke
This command places a value in a location of the computer's memory. It can only be used to access RAM or control registers.

Port
Terminal which the *CPU* uses to communicate with the outside world.

Print At
A BASIC command telling the computer where to begin printing.

Print Out
Same as *hardcopy*.

Program
A set of *instructions*, which tells the computer to perform a sequence of tasks also called software.

PROM
Programmable Read Only Memory. Proms are a special form of *ROM*, which can be individually programmed by the user.

Qwerty
The traditional typewriter keyboard layout adopted by computer designers.

RAM
Random Access Memory. *Data* may be written to or read from any location in this type of memory.

Register
A general-purpose *memory*, or set of memory *locations*, built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

RND
In BASIC this stands for RANDOM and instructs the computer to select random numbers, it is often used in games programs. Because the numbers thrown up are mathematically related to the number preceding they are called pseudo-random numbers, not true random-numbers.

ROM
Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

Routine
A whole *program* or part of a program designed to perform a single function or action.

RS232
A communications *interface* used for *modems* and for serial *printers*.

Sequential File
This is a data file that can be created on either a disc or a cassette system. As its name suggests, the information is stored one piece after another. If this information is to be changed or modified in any way then the whole file has to be read back into memory and then written back again once the changes have been made.

Software
The different kinds of *program* required to work a computer.

Source Code
Program written in one of the *high-level languages* and requiring *compilation* into *machine language* before use.

String
A sequence of characters used in a program.

Subroutine
A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax
The grammar of a programming *language*.

Tab
Really stands for tabulate and allows you to automatically put figures and/or words into columns, forming a table.

Toolkit
Name given to a piece of code that runs in a computer independantly of any other programs and adds commands to the machines language to make the process of programming or debugging easier. Commands such as Renumber, Auto and Trace are common in toolkits. Toolkits take the form of a program that is loaded into the machine on power-up or a chip that is inserted on the circuit board which is then initialised by a SYS or USR call from the operator.

Variable
A symbol used in programming which is assigned a numeric memory address. You can change the value of variable at will to suit the program you are writing.

VDU
Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

Z80
Widely used microprocessor. It is used in the ZX81, Spectrum and TRS-80.

6502
Another widely used microprocessor. It is the heart of the PET, Apple and Atari computers.

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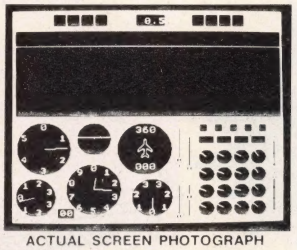

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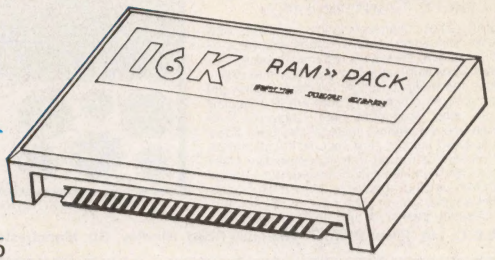

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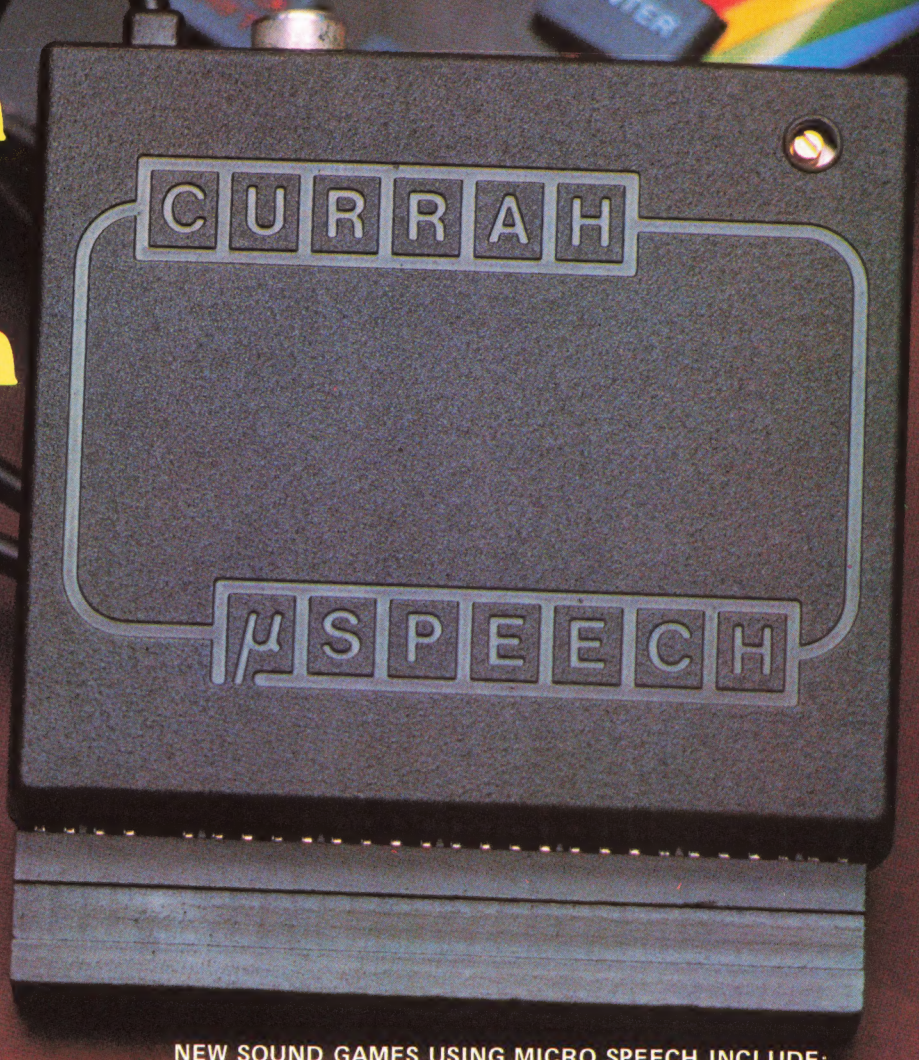

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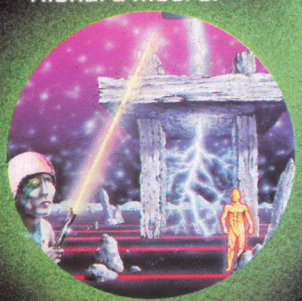

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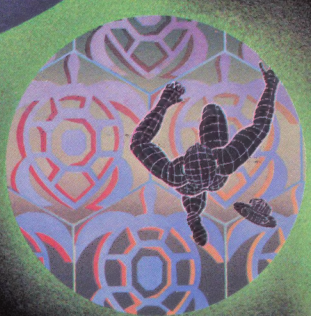

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